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SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE.
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OCEANIC ICHTHYOLOGY,

A TREATISE ON THE

DEEP-SEA AND PELAGIC FISHES OF THE WORLD,

BASED CHIEFLY UPON

THE COLLECTIONS MADE BY THE STEAMERS BLAKE, ALBATROSS,
AND FISH HAWK IN THE NORTHWESTERN ATLANTIC,

WITH

AN ATLAS CONTAINING 417 FIGURES.

BY

GEORGE BROWN GOODE, PH. D., LL. D.,
Assistant Secretary Smithsonian Institution in charge of U. S. National Museum,

AND

TARLETON H. BEAN, M. D.,
Director of the New York Aquarium.

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COMMISSION TO WHOM THIS MEMOIR HAS BEEN REFERRED.

THEODORE GILL.
DAVID STARR JORDAN.
EDWARD D. COPE.

ADVERTISEMENT.

The following memoir, by Doctors G. Brown Goode and Tarleton H. Bean, having been published at the joint expense of the Smithsonian fund and of the printing appropriation of the United States National Museum, two separate editions are issued, one forming a portion of the series of Smithsonian Contributions to Knowledge, and the other appearing as a special bulletin of the United States National Museum.

In accordance with the rule adopted by the Smithsonian Institution, the work has been submitted for examination to a commission consisting of Doctors Theodore Gill, David S. Jordan, and Edward D. Cope, and having been recommended for publication by these gentlemen, it is herewith presented as a work of original research, illustrating more particularly the deep-sea and pelagic fishes of the world.

S. P. Langley,
Secretary.

Smithsonian Institution,
Washington, July, 1895.

OCEANIC ICHTHYOLOGY.

INTRODUCTION.

OUR purpose has been to present in OCEANIC ICHTHYOLOGY a discussion of all forms of fishes found in the seas of the world, both pelagic species and those occurring at depths greater than 500 feet, especial prominence being given to those species which are found in the Atlantic Ocean, most of which we have had opportunity to study. All oceanic fishes are included, partly because it is not yet possible to distinguish strictly between the two classes, and partly because the pelagic forms have, in part at least, been mentioned in the discussions by all previous writers on "deep-sea fishes."

By *Oceanic fishes* we mean those deep sea and pelagic species which dwell in the open ocean far from the shore, either at the surface, at the bottom, beyond a depth of 500 feet, or, if such fishes there be, the intermediate zones.

Oceanic Ichthyology is that branch of ichthyology which is concerned with their study.

Deep-sea fishes are those which are found at a depth of 1,000 feet or more, without reference to the question whether or not they also occur in shallower water. The limit of 500 feet is taken for convenience in the study of the origin of local deep-sea faunas. The limit of 100 fathoms is that ordinarily in use. The Reports of the *Challenger* class as "deep-sea deposits" all those below 100 fathoms depth. The zone between the litteral zone, and the bathybial zones, 500-1000 feet, is called the "hemibathybial zone"

Pelagic fishes are those which live far from land and at a distance from the bottom, rarely approaching the shore except when driven by wind or current. It is these which are most closely associated with the "Plankton," and were included in it before the meaning of the term, as proposed by Hensen, was limited by Haeckel. Some of these, which occur at considerable depths, we call "bathypelagic."

We can not claim that in the present memoir we have brought forward any conclusions which are new to science, though a great number of new facts are recorded. We hope, however, that we have succeeded in the attempt to bring the information which we have ourselves been able to obtain into proper relationship with the mass of similar knowledge already recorded, and that our descriptions are so accurate and full that the deterioration or loss of the material studied, much of which was in very fragmentary and precarious condition when it came to us, may not be entirely disastrous. We have tried to assemble all existing data about oceanic fishes and to arrange them in such a manner that they may be serviceable to naturalists in other fields for comparison and study, as well as to ichthyologists for ready reference, when at a distance from the rather extensive group of books which must now be consulted even for the casual identification of a deep-sea fish. We have also endeavored to sum up the conclusions reached by previous students before incorporating our own results with those of our predecessors.*

NOTE.—I have in preparation and shall soon publish an extended study of the geographical distribution of deep-sea and pelagic fishes, and of the origin of the several bathybial fish faunas.

G. BROWN GOODE.

When this volume was begun, it was not intended to include so large a field within its scope, but unexpected delays have brought us to a time when there is an entire discontinuance of deep-sea work, and when the final ichthyological results of all past expeditions have been published.

In 1885 Prof. Collett, of the University of Christiania, published a volume upon the fishes of the Norwegian North Sea Expedition. In 1887 Dr. Günther, of the British Museum, published his great work on "The Deep-Sea Fishes of the *Challenger* Expedition". In 1888 Dr. Vaillant, of the Museum of Natural History in Paris, reported upon the Deep-Sea Fishes of the *Travailleur* and *Talisman* Expedition, and in the same year Mr. Alexander Agassiz presented his admirable "Contributions to American Thalassography", in which, for the first time, were presented in compact form the results of the ichthyological work of the Coast Survey and the Fish Commission.

These four magnificent works, together with the various short papers since published by American and Scandinavian naturalists and by Mr. S. Alcock upon the deep-sea fishes of India, relate to a group of animals concerning which, until recently, naturalists knew almost nothing.

The study of oceanic ichthyology is still in its infancy and yet many very remarkable results have been obtained. Although not more than 600 (?) different kinds of fishes have been obtained from the depth of 1,000 feet and more, it would appear that a very good general idea of the character of the fauna has already been acquired. This is indicated by the fact that fishes are constantly being rediscovered in the most remote localities. A form obtained by Lowe in Madeira in 1876 was rediscovered by us off the New England coast in 1881, and by German naturalists in the Japanese Sea in 1879, by the *Blake* near Barbadoes in 1880, and a year or two later off the coast of Soudan. Several previously known only from New Zealand have been obtained by the Fish Commission off the New England coast, and some of our own genera and species have lately been discovered in the Bay of Bengal.

Although the capture of certain individual forms in widely remote localities in the oceanic abyss might be interpreted to mean that the field has been somewhat fully explored, and that it is now being gone over a second or third time, such an interpretation would be misleading. Our knowledge of abyssal life is still exceedingly imperfect. New species and genera are obtained every time the nets are lowered to the bottom in an untried spot. Very many forms have been taken in only one locality, and are represented in the museums by unique specimens, so that the ichthyologist has not material enough to enable him to study the structure of the organisms to which he has given a name. Then, too, the appliances for the capture of the fishes of any region, especially those which are believed to live suspended in the middle strata of mid-ocean, are so imperfect, and the likelihood is great that there are many forms so organized that they can not well be taken by small slow-moving nets, that naturalists will surely fall into error if they suppose themselves in possession of anything like an adequate equipment for a final study of the subject.

It seems probable that there are many inhabitants of the depths which are too swift, too wary and cunning, or too large thus to be taken. It cannot be doubted, for example, that somewhere in the sea, at an unknown distance below the surface, there are living certain fish-like animals, unknown to science and of great size, which come occasionally to the surface and give a foundation to such stories as those of the sea serpent.

To appreciate the meager extent of our knowledge of what is going on in mid-ocean it is only necessary to think of such a fish as *Chiasmodon* and its history. *Chiasmodon* is one of those grotesque looking pelagic fishes with yawning, flexible jaws and a vastly distensible stomach, which is able to engorge other fishes equal, or more than equal, in size to itself. This practice is naturally attended by disaster, and the *Chiasmodon*, in the event of death, is brought to the surface by the expansion of the gases in its tissues. Such accidents evidently happen very often. The chances were few, nevertheless, that waifs of this kind should fall into the hands of naturalists, and yet within forty years *Chiasmodon* has occurred five times. On the other hand, *Chiasmodon*, although so abundant, has only once been taken by the deep-sea nets.

Another ocean dweller which the exploring ships have not yet discovered is *Regalecus*, or the "Oar-fish," a serpent shaped, rapidly swimming form, usually from 18 to 24 feet in length, which occasionally is stranded on the shore in the stormy season. Within the past one hundred and fifty years individuals have visited the shores of Norway, Finmark, the Faroe Islands, Scotland, Ireland, England, Mediterranean, France, Bermuda, the Cape of Good Hope, Hindustan, and New Zealand. Günther gives a list of 44 seen by naturalists, and this is of course but an insignificant part of those which have actually been stranded. Its world-wide distribution and the number of waifs give evidence that it is abundant in mid-ocean, yet the exploring ships in all the years of their combined searchings have found no vestiges of it, old or young.

Many similar cases might be cited, but our object is simply to call attention to the great necessity for further exploration of the depths.

The distinctions between the inhabitants of deep water, those of the middle depths, and those of the surface strata of mid-ocean are not yet absolutely fixed. Such are the imperfections in the methods of trawling and dredging that the naturalist, when he has sorted out the fishes from his nets after a haul in mid-ocean, is often in doubt as to where his captures have been made. If he has taken a flounder from a haul of 800 fathoms, or finds a macrurid, a brotulid, a stomiatid, a synodontid, or a nemichthyid in a net which has been below the 2,000-fathom line, he feels reasonably sure that he has brought it up from the bottom. But who shall say where *Argyropelecus*, *Sternoptyx*, *Myctophum*, having allies among the pelagic fishes in the same net, have come from? It may be from the bottom, or they may have become entangled in the meshes of the trawl when but a few fathoms from the surface, coming up or going down.

The recent investigations of Mr. Agassiz in the Pacific, with the Tanner net, seem to show pretty conclusively that there are but few living forms below a depth of 1,800 or 2,000 feet and that the *Myctophidæ* stay for the most part, if not entirely, between that depth and the surface. It is possible to draw inferences from the experiments in regard to many forms which, like the *Myctophidæ*, are known frequently to occur swimming at the surface at night, but there are also doubtful cases, like *Bathyophis*, *Rhodichthys*, *Microstoma*, and many others, which need further consideration.

Another great need is for more, and more perfect, material. Fully one-half of the deep-sea forms are now represented only by single specimens, and many important anatomical questions can not be solved, because these uniques may not be sacrificed to dissection. Half of the families of Malacopterygians mentioned in this report can not be assigned to their proper places, because their skeletons have not been fully examined.

Besides this, the imperfection of the existing specimens is a great drawback. The material is of a kind which it is peculiarly difficult to study. Not only are the forms strange and difficult to assign to their proper taxonomic relationships, but, owing to the soft, cavernous skeletons, and the flabby muscles, tender skins, deciduous scales, and fragile appendages which are characteristic of many of them, they are very liable to injury. After these delicate animals have been drawn up from a depth of 2 or 3 miles in rough nets, they are, as might be expected, in a very dilapidated condition. It has often been found necessary to examine a score of more of individuals, in order to be able to appreciate characters which could commonly be made out from a single specimen.

The studies which have led to the writing of this book were begun in the summer of 1877, when the first deep-sea fishes were caught by American nets on the coast of North America. This took place in the Gulf of Maine, 44 miles east of Cape Ann, on the 19th of August, when from the side of the U. S. Fish Commission steamer *Speedwell* the trawl net was cast in 160 fathoms of water. The writers were both standing by the mouth of the net when, as the seaman lifted the end of the bag, two strange forms fell out on the deck. A single glance was enough to tell us that they were new to our fauna, and probably unknown to science. They seemed like visitors from another world, and none of the strange forms which have since passed through our laboratory have brought half as much interest and enthusiasm. *Macrurus Bairdii* and *Lycodes Verrillii* were simply new species of well-known deep-dwelling genera, and have since been found to be very abundant on the continental slope, but they were among the first fruits of that great harvest in the field of oceanic ichthyology which we have had the pleasure of helping to garner in the fifteen years which have passed since that happy and eventful morning. It seems incredible that American naturalists should not then have known that a few miles away there was a fauna as unlike that of our coast as could be found in the Indian Ocean or the seas of China.

It should be remembered that although the *Challenger* has been back more than a year from her long cruise, her treasures were as yet undescribed, and that no one knew what a marvelous wealth of material she had gathered except the naturalists on board. Even they can scarcely have expected that year after year the great quarto volumes of these final reports would continue to be printed, until to-day there are forty of them—the magnificent outcome of the most liberally equipped exploring expedition ever sent out by any nation. Oceanic ichthyology was as yet unborn.

A year later Dr. Günther began to publish the preliminary descriptions of the *Challenger* fishes in the London Annals and Magazine of Natural History, and a new interest was added to the study of ichthyology. From that time until now we have never been without a wealth of attractive oceanic material for study, and the genera and species announced by us from the western Atlantic have been more in number than those brought back by the *Challenger*, yet the discoveries made in those earliest years have always seemed the most interesting.

It may be asked how it happened that no deep-sea fishes had been taken by the Coast Survey vessels which began dredging in 1867, or by those of the Fish Commission which began in 1871. The answer is a simple one. The Fish Commission vessels were small, and did not venture outside of the hundred-fathom line until 1877, and the Coast Survey in those days collected with the dredge only. When Mr. Agassiz took charge of the biological work of the Coast Survey, in 1877, he introduced the trawl net, and began to collect fishes, but these did not come into our hands until 1883. The nets were not really perfected until 1883, when the *Albatross* and the *Travailleur* began their cruises.

In 1878 the headquarters of the Fish Commission was at Gloucester, and we began to receive from the Cape Ann fishermen deep-sea forms taken by them on the off-shore banks. In this way came our *Haloporphyrus viola* and *Lycodes paxillus*, brought by Capt. J. W. Collins, then of the halibut schooner *Marion* and since well-known by his writings upon the fisheries; our *Argentina syrtensium*, G. & B. (since identified with *A. silus* of Europe); *Lycodes Vahlii*, a Greenland form, brought by Capt. Hawkins, of the schooner *Gwendolen; Anarrhichas latifrons*, *Alepidosaurus ferox*, *Alepocephalus Bairdii*, G. & B.; *Synaphobranchus pinnatus*, *Simenchelys parasiticus*, Gill; *Chimæra plumbea*, Gill (=*affinis*, Boc. & Cap.); *Centroscyllium Fabricii* and *Centroscymnus cœlolepis*, *Echiostoma barbatum*, *Chauliodus Sloanei*, *Reinhardtius hippoglossoides*, *Macrurus rupestris*, *Lopholatilus chamæleonticeps*, G. & B.—all received in time to be catalogued in our Fishes of Essex County, Massachusetts, published in 1879, together with *Phycis Chesteri*, G. & B., and *Eumicrotremus spinosus*, obtained in the same year by the Fish Commission vessels.

In 1880 the Fish Commission began its explorations of the Gulf Stream off the south coast of New England. Dr. Bean was on the Pacific coast and the following were described by Dr. Goode: *Monolene sessilicauda*, *Citharichthys arctifrons*, *C. unicornis*, *Thyris pellucidus*, *Hypsicometes gobioides*, *Peristedium miniatum*, *Macrurus carminatus*, *Halieutæa senticosa*, *Limanda Beanii*, *Amitra liparina*, *Cottunculus torvus*, *Setarches parmatus*, *Chlorophthalmus chalybeius*, *Notacanthus phasganorus*, *Monolene*, *Hypsicometes*, and *Amitra* being new genera, and *Mancalias uranoscopus*, *Chaunax pictus*, and *Cottunculus Thomsoni* were added to the fauna.

Apogon pandionis and *Benthodesmus elongatus* were found in the same year.

In 1881 we undertook, at the request of Prof. Baird and Mr. Agassiz, to produce a work upon the fishes of the Coast Survey and the Fish Commission together, and discontinued the publication of preliminary descriptions, it being our hope to print a final memoir upon them without much delay. It was not until 1891, however, that we were able to complete our studies, the illness and death of Prof. Baird having interrupted the work and thrown upon each of us new responsibilities which left little time at our command. We had, however, prepared for Mr. Agassiz preliminary reports upon the deep-sea fishes of the *Blake*, taken in 1880 (published in 1883), and upon those taken in 1878 and 1879 (published in 1886), and had also furnished the notes upon the fishes for his general work, Three Cruises of the Blake. Besides the *Blake* fishes of 1878–'79–'80, we continued to receive those from the *Albatross* until that vessel passed into the Pacific in 1888. Her more recent collections are being worked up by Prof. C. H. Gilbert and by Dr. Bean, who is studying those of the Alaskan seas, and by Mr. Garman, who is reporting upon those obtained off the west coast of Central America, partly made under the direction of Mr. Agassiz in 1891.

The work, as it now appears, is in many respects very unsatisfactory to its authors. It has been written at odd hours snatched from administrative duties, too often in the very midst of them—always under the pressure of haste, and always with the feeling of impatience that more exhaustive studies could not be made. Later, serious illness delayed its printing.

As first planned it was to include only the oceanic fishes of the east coast of North America, but it gradually expanded to embrace all those species of the Atlantic Basin and all the oceanic genera of the world.

It was first ready for the press in 1885, then revised and rewritten in 1888, then again in 1891, and again in 1894 as it was going through the press.

The appearance of Günther's final reports upon the *Challenger* fishes, 1887, of Vaillant's upon those of the *Travailleur* in 1888, of Alcock's *Investigator* papers in 1889-1892, of Collett's *Hirondelle* notes in 1889, have each, in their turn, caused much revision and rewriting, and the appearance of Lütken's Spolia Atlantica, Part II, printed in 1892, has made it necessary to reset a number of pages.

In its present form it stands as a compendium and summary of existing knowledge in regard to Oceanic Ichthyology. No one knows when there will be opportunity for its further study. There are no expeditions and there seems to be no prospect for new ones. Even the *Albatross*, built by the United States expressly for this service, is diverted to police duty about the Seal Islands.

Public interest is sated by the crude preliminary results already obtained. The scientific world knows that the knowledge of to-day, in all branches of thalassographic work, is incomplete and rudimentary in the extreme, and that, with the experience now acquired, the results of future exploration will be immensely greater. We can only hope for a renaissance in this field.

In making acknowledgments to those who have aided in this work, we think first of our dear friend, the late Prof. Baird, of the pains with which he provided every facility, and of the interest with which, twice a day, when studies were in progress, he came to the laboratory to talk over the discoveries and discuss them. To his successor as Commissioner of Fisheries, Col. McDonald, we owe the granting of every request we have made, and our requests have been many. To Mr. Alexander Agassiz we are likewise indebted for courtesies many and great, not the least of which is the patience with which he has waited ten years for a report which was promised in three. To Prof. Theodore Gill we offer our thanks for counsel and information, lavishly and ungrudgingly bestowed, out of the fullness of his ichthyological wisdom. To Commander Z. L. Tanner, U. S. N., in command of the *Albatross*, and Mr. J. E. Benedict, naturalist of the ship, much is due for the manner in which the collections were gathered and preserved. To Dr. Günther we owe inspiration and kindly advice; to Dr. Sauvage, of the Museum of Natural History in Paris, to Dr. Lütken, to Prof. Collett and to Dr. Alcock, to Dr. Hilgendorf, President Jordan, and Mr. Garman, frequent letters and the use of specimens; to Prof. Giglioli, the use of his matchless collection of Italian vertebrates, among which were the fishes collected by the steamer *Washington* in the Mediterranean. Capt. H. T. Brian, of the Government

Printing Office, has also aided materially in the work by his advice. Mr. Barton A. Bean has aided in the handling of the collections and illustrations and measurement of specimens, and Mr. J. L. Willige has rendered useful service in the preparation of the tables of locality and distribution and in proof reading.

Only twenty years ago the fish fauna of the deep sea was represented in collections by forty or fifty specimens, representing not more than twenty species at the most—accidental waifs picked up at the surface or cast ashore by the waves—"like the few stray bodies of strange red men which tradition reports to have been washed on the shores of the Old World before the discovery of the New, and which served to indicate the existence of unexplored realms inhabited by unknown races, but not to supply information about their character, habits, and history."[1]

If the coming twenty years shall produce one-tenth so much in the way of discovery in the life of the deep seas, it will be more than it now seems reasonable to expect.

G. BROWN GOODE.
TARLETON H. BEAN.

SMITHSONIAN INSTITUTION,
Washington City, April 1, 1895.

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[1] Edward Forbes.

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LIST OF THE NEW GENERA AND SPECIES OF DEEP-SEA FISHES, DESCRIBED BY THE AUTHORS, WITH ETYMOLOGIES.

NEW GENERA.

Abyssicola	Dwelling in the abysses of the sea (*ἄβυσσος*, a bottomless pit, and *κολέω*).
Acrotus	Without oars; in allusion to the absence of ventral fins (*ἀ*, privative, and *κρότος*, an oar or paddle).
Æthoprora	With a flashing light ahead (*αἴθων*, flashing, and *πρῶρα*, the prow of a vessel).
Aldrovandia	In honor of Aldrovandi, the Italian ichthyologist of the sixteenth century.
Amitra	Without a belly-plate (*ἀ*, privative, and *μίτρα*, a plate worn below the cuirass by Greek warriors); in allusion to the absence of the ventral disk.
Barathrodemus	A dweller in the depths (*βάραθρον* and *δῆμος*).
Barathronus	An *Onos*-like fish from the depths (*βάραθρον* and *ὄνος*).
Bathylaco	A warrior of the ocean depths (*βαθύς* and *λάκων*).
Benthocometes	A dweller in the depths (*βένθος*, the depths, and *κομήτης*).
Benthodesmus	A deep-sea ribbon (*βένθος* and *δεσμός*).
Benthosaurus	A lizard-like fish from the depths of the sea (*βένθος* and *σαῦρος*).
Benthosema	A deep-sea constellation (*βένθος* and *σῆμα*); in allusion to the number and brilliancy of its luminous spots.
Bonapartia	In honor of Lucien Bonaparte, Prince of Canino, the illustrious Italian ichthyologist.
Bothrocara	With cavities in the head (*βόθρος*, a pit, and *κάρα*, head).
Caulophryne	A *Phryne* like fish with the cephalic tentacle supported on a stem-like base (*καυλός*, a stem, and *φρύνη*, a toad).
Celema	A fanciful name, from *κήλημα*, a charm.
Cetomimus	"Very like a whale" (*κῆτος* and *μῖμος*).
Chalinura	With a tail like a strap (*χαλινός* and *οὐρά*).
Collettia	In honor of Dr. Robert Collett, the Norwegian ichthyologist.
Conocara	With a conical head (*κῶνος*, a cone, and *κάρα*, head).
Cyclothone	With rounded opercular flaps (*κύκλος*, round, and *ὀθόνη*, a veil).
Dasycottus	A thick-tailed *Cottus* (*δασύς* and *κόττος*).
Delothyris	Transparent as a window (*δῆλος*, clear; *θυρίς*, a window).
Dicrolene	With forked pectoral fins (*δίκρος*, cleft; *ὠλένη*, an arm).
Dicromita	Having the ventrals represented by a pair of thread-like rays (*δίκρος*, double, and *μίτος*, a thread).
Electrona	Full of light (*ἤλεκτρον*).
Gigliolia	In honor of Commendatore Enrico Hillyer Giglioli, the Italian ichthyologist, director of the Royal Museum of Natural History in Florence.
Grammatostomias	A *Stomias*, ornamented with stripes (*γράμμα*, a line, and *Stomias*).
Halieutella	A smaller *Halieutæa*.
Harriotta	In honor of Thomas Harriott, the first English man of science who made explorations in America.
Helicolenus	With strong pectoral fins (*ἥλικος*, strong, and *ὠλένη*, an arm).
Hilgendorfia	In honor of Dr. Franz Hilgendorf, the German ichthyologist.
Hypoclydonia	From far beneath the waves (*ὑπό* and *κλύδων*).
Hypsicometes	A dweller in deep water (*ὕψι*, in deep water, and *κωμήτης*, a dweller).
Investigator	To perpetuate the name of H. M. S. *Investigator*, engaged in deep-sea exploration in the Indian Ocean.
Lampadena	Having a lamp-like organ on its tail (*λαμπάς* and *ἀδήν*, a gland).

LIPOGENYS	Without an under jaw (λείπω, to lack, and γένυς, the under jaw).
LOPHIODES	Allied to *Lophius.*
LOPHOLATILUS	A crested *Latilus* (λόφος and *Latilus*).
LYCODONUS	A genus resembling *Lycodes.* (The termination *onus* is without significance.)
MALACOCOTTUS	A soft-bodied *Cottus* (μαλακός and κόττος).
MANDUCUS	A voracious feeder (*Manducus*, a grotesque, marked figure representing a person chewing, used in the Roman theater in classical days).
MŒBIA	In honor of Prof. Karl Möbius, director of the Berlin Zoological Museum.
MONOLENE	With a single pectoral fin (μόνος, single; ὠλένη, an arm.)
MONOMITRA	Without a ventral disk (μόνος, deprived of, μίτρα, a shield for the belly).
MOSELEYA	In honor of Henry Nottidge Moseley, F. R. S., one of the naturalists of the *Challenger.*
NEOBYTHITES	A newly discovered genus allied to *Bythites* (νέος and βυθίτης).
NOTOSEMA	With a banner-like dorsal fin (νῶτον, the back, and σῆμα, a banner).
PENOPUS	With thread-like ventral fins (πήνη, a thread, and πούς, a foot).
POROGADUS	A *Gadus*-like fish, with openings in its skin (πόρος and *Gadus*).
POROMITRA	With openings in its shields (πόρος and μίτρα); in allusion to the central depression in each round, concentrically-grooved scale.
RONDELETIA	In honor of Guillaume Rondelet, the French ichthyologist of the sixteenth century.
STEINDACHNERIA	In honor of Dr. Franz Steindachner, the Austrian ichthyologist.
TALISMANIA	For the French steamer *Talisman*, engaged in deep-sea exploration in the northeast Atlantic.
YARRELLA	In honor of William Yarrell, the British ichthyologist.

NEW SPECIES.

ÆQUATORIS (Talismania)	Taken under the equator.
AGASSIZII (Alepocephalus). (Bathysaurus.) (Dicromita.) (Scorpæna.)	In honor of Alexander Agassiz, director of the Museum of Comparative Zoology and of several deep-sea exploring expeditions—the leading spirit in American thalassographic research.
ALASCANUS (Sebastolobus)	Found in Alaska by Dr. Bean.
ALATUS (Lampanyctus) (Prionotus.)	Having long, wing-like fins.
ALCOCKI Argyropelecus (Diplacanthopoma.)	In honor of Capt. Surg. A. Alcock, director of the Indian Museum, Calcutta, and of his discoveries in the deep-sea ichthyology of the Indian Ocean.
ANTILLARUM (Talismania)	Taken among the Antilles.
AQUILONARIS (Anthias)	Northern (*aquilo*, the north wind).
ARCTIFRONS (Citharichthys)	With a narrow forehead (*arceo* and *frons*).
ARGENTEA (Bathyclupea) (Steindachneria.)	Glittering like silver.
ARCUATUS (Bathygadus)	With a curved or arched profile (*arcus*, a bow).
ATLANTICUS (Benthodesmus) (Bregmaceros.)	An Atlantic form.
ATRIMANA (Monolene)	Black-handed (*ater* and *manus*); in allusion to the dark tip of the single pectoral.
BAIRDII (Macrurus)	In honor of Prof. Spencer Fullerton Baird, secretary of the Smithsonian Institution, founder of the United States Fish Commission.
BARBATULA (Læmonema)	With a little beard.
BEANII (Limanda) (Prionotus.)	Named by Mr. Goode in honor of his colleague, Dr. Bean.
BELLA (Hypoclydonia)	Beautiful.
BENEDICTI (Bathylagus)	In honor of James E. Benedict, naturalist of the *Albatross.*
BICOLOR (Barathronus) (Rondeletia.)	Of two colors.
BLACKFORDI (Yarrella)	In honor of Eugene G. Blackford, of New York, fish culturist and angler, president of the New York State Fish Commission
BREVIBARBIS (Chalinura)	Short-bearded.
BREVIPES (Lycodes)	With short ventral fins.
BRUNNEA (Maynea)	Brownish, tawny.

CAPITO (Poromitra)	Large-headed.
CARAPINUS (Coryphænoides)	Resembling in form the genus *Carapus*.
CARIBBÆUS (Cœlorhynchus)	From the Caribbean Sea.
CASTANEUS (Notoscopelus)	Chestnut-hued.
CATENA (Bassozetus)	Having a chain-like row of pores along the lateral line (*catena*, a chain).
CAVERNOSUS (Hymenocephalus)	With depressions in the skull.
CERVINUM (Leptophidium)	Spotted like a fawn.
CHALYBEIUS (Chlorophthalmus)	Of a steel-like luster (*Χαλύβειος*).
CHAMELEONTICEPS (Lopholatilus)	Having a head with a nuchal appendage suggesting that of the African chameleon, (*Chameleo*).
CHESTERI (Phycis)	In honor of Capt. Hubbard C. Chester, of the United States Fish Commission, sailing master of the Arctic exploring steamer *Polaris*, and later engaged in deep-sea work.
CIRRATUS (Phycis)	Bearded (*cirra*).
COPEI (Paraliparis)	In honor of Prof. Edward Drinker Cope, of the University of Pennsylvania, a leader in American vertebrate zoology.
CRUENTIFER (Pisoodonophis)	Sanguinary, cruel; in allusion to its habit of boring into the flesh of living fishes.
DENTATUS (Grammatostomias)	With conspicuous teeth.
DILECTA (Notosema)	Admired, beloved (*diligo*); in allusion to the beauty of the species.
DINOCEROS (Citharichthys)	With a strong spine or "horn" upon the forehead (*δεινός* and *κέρως* or *κερῶός*).
DIOMEDIANA (Aphoristia) DIOMEDIANUS (Hoplunnis).	To perpetuate in ichthyological literature the name of the deep-sea exploring steamer *Albatross*. See Pardionis.
EARLLII (Phycis)	In honor of R. Edward Earll, of the United States Fish Commission and National Museum, by whom the species was discovered.
EFFULGENS (Æthoprora)	Gleaming, phosphorescent.
EGRETTA (Prionotus)	In allusion to the elongate dorsal ray, resembling the plume of an *Egretta*.
EURYOPS (Bathylagus) (Icelus.)	Large-eyed (*εὐρύς* and *ὤψ*).
FAVOSUS (Bathygadus)	Cavernous (from *favus*, a honeycomb); in allusion to the cavities in the skull
FIMBRIATA (Cyclopsetta)	With fringed fins (*fimbria*, fringe).
FLAVA (Congermuræna)	Tawny-hued.
FULVUS (Physiculus)	Tawny.
GEMMIFER (Lampanyctus) (Astronesthes.)	Covered with gem-like studs.
GILLII (Bassogigas) (Cetomimus.) (Labichthys.) (Lipogenys.) (Neobythites.) (Stephanoberyx.)	In honor of Dr. Theodore Gill, the Nestor of American Ichthyology, 1895.
GOBIOIDES (Hypsicometes)	Resembling a *Gobius*.
GRACILE (Aldrovandia) (Myctophum.) (Peristedion.) (Photonectes.)	Slender and graceful in form.
GRALLATOR (Benthosaurus)	Having extremities like stilts.
HIMANTOPHORUS (Callionymus)	Having a thong like extension of the middle ray of the tail fin (*ἱμάς* and *φέρειν*)
HOLOLEPIS (Cyttus)	Completely covered with scales (*ὅλως* and *λεπίς*), in distinction from certain species in the same genus which are partly naked.
INTRONIGRA (Dicrolene)	Black within; in allusion to the dark peritoneum.
JORDANI (Caulophryne)	In honor of David Starr Jordan, president of Leland Stanford Junior University, one of the most learned and productive of ichthyologists.
LACERTA (Lampanyctus)	With a lizard-like head.
LAPPA (Halieutella)	A spiny species (*lappa*, a burr).
LIPARINA (Amitra)	Resembling the genus *Liparis*.
LONGISPINIS (Pontinus)	With very long spines in the first dorsal fin.
LUCIDA (Æthoprora)	Shining, bright, full of light.
MACDONALDI (Conocara) (Nannobrachium.) (Penopus.)	In honor of Col. Marshall McDonald, United States Commissioner of Fisheries since 1888.

MACOUNI (Chauliodus)	Named by Dr. Bean in honor of Prof. John C. Macoun, of the Geological Survey of Canada.
MACROLEPIS)Pontinus)	Covered with large scales (*μᾶκρὸς* and *λεπὶς*).
MACROPS (Bathygadus)	Large-eyed.
MADERENSIS (Helicolenus)	Madeiran.
MANATINUS (Barathrodemus)	With a head shaped like that of a sea cow (*Manatus*).
MARGARITA (Echiostoma)	In compliment to Miss Margaret ———.
MARGARITIFERUS (Notoscopelus)	Ornamented with pearl-like studs.
MARGINATA (Aphoristia)	With a marginal line at base of vertical fins.
MARGINATUS (Neobythites)	With dark margins to the vertical fins.
MARMORATUM (Leptophidium)	Marbled.
MELANURUM (Læmonema)	With a black tail (*μελας* and *ουρα*).
MILES (Porogadus)	Warlike (*miles*, a soldier).
MILITARIS (Prionotus)	Soldier-like; in allusion to the plume-like rays in the dorsal fin.
MINIATUM (Peristedion)	Cinnabar-red (*minium*, cinnabar).
MIRABILIS (Lycodonus)	Remarkable; in allusion to peculiar structure of dorsal and anal fins.
MOLLIS (Aphyonus) (Bothrocara.)	Soft, flabby, gelatinous.
MOSELEYI (Gigliolia)	In honor of the late Henry Nottidge Moseley, F. R. S., Linacre professor in the University of Oxford, and one of the naturalists of the *Challenger* Expedition.
NEBULOSA (Aphoristia)	With cloudy colorations.
OCCA (Cœlorhynchus)	Rough-scaled (*occa*, a harrow).
OCCIDENTALIS (Chalinura) (Epigonus.) (Malacocephalus.)	From the Western Atlantic.
OPALINUM (Myctophum)	Decorated with opal-like studs (*opalus*, an opal).
PÆTULUS (Citharichthys)	Slightly cross-eyed.
PALLIDA (Aldrovandia)	Pale; colorless.
PANDIONIS (Glossamia)	To preserve in ichthyological literature the memory of the deep-sea work of the United States Fish Commission steamer *Fish Hawk*. (*Pandion*, the generic name of the American fishhawk.)
PARADOXUS (Psychrolutes)	Astonishing, and hard to identify relationship.
PARMATUS (Setarches)	With scales like round shields (*πάρμη*).
PARVIPINNIS (Dicrotus)	With feeble fins.
PAXILLOIDES (Lycenchelys)	A little peg or spike (*paxillus*); in allusion to the spindle-like body.
PAXILLUS (Lycenchelys)	Spindle-shaped.
PECTORALIS (Nematonus)	Having conspicuous pectoral fins.
PEDALIOTA (Bonapartia)	Having a rudder-like fin (*πηδᾶλιωτὸς*).
PHASGANORUS (Notacanthus)	Scabbard-shaped (*φάσγανον*, a scabbard).
PIGRA (Aphoristia)	Sluggish and slow (*piger*).
PLATYCEPHALUM (Peristedion)	Flat-headed.
PROCERA (Venefica)	Elongate.
PROFUNDORUM (Scylliorhinus)	Out of the depths.
PUSILLA (Aphoristia) (Maynea.)	Small, insignificant.
QUERCINUS (Notoscopelus)	In color like a dry oak leaf.
RALEIGHANA (Harriotta)	In honor of Sir Walter Raleigh, explorer and man of science.
RANULA (Careproctus)	Like a tadpole in looks (*ranula*, a little frog).
RATHBUNI (Pontinus)	In honor of Dr. Richard Rathbun, naturalist, long chief of the division of scientific inquiry in the United States Fish Commission.
REMIGER (Myctophum)	Having long, oar-like pectoral fins (*remus* and *gero*).
RIMOSUS (Etropus)	Rough-looking, full of cracks and fissures (*rima*).
ROBUSTUS (Benthocometes)	Heavy-bodied, robust.
SCUTIGER (Icelus)	With scales like shields.
SENTICOSA (Halieutæa)	Prickly.
SERRULA (Chalinura)	With a saw-edged fin spine (*serrula*, a little saw).
SESSILICAUDA (Monolene)	Having no caudal peduncle (*sessilis*, sessile, and *cauda*).
SETIGER (Dasycottus)	With a bristle-like fin ray.
SIMULA (Chalinura)	Pug-nosed (*simulus*).
SPECULIGERA (Lampadena)	Covered with glistening mirrors (*speculum* and *gero*).
STORERI (Cetomimus)	In honor of the late Dr. David Humphreys Storer, of Boston, a pioneer in American ichthyology.
STRIATA (Argentina)	Alluding to the furrow-like stripe along the lateral line.
SULCATUS (Coryphænoides)	Furrowed (*sulca*).

TORVUS (Cottunculus)	Gloomy and savage in aspect.
TRUCULENTUS (Chlorophthalmus)	Savage-looking.
UNICORNIS (Citharichthys)	With one horn upon the forehead.
VENTRALIS (Trichopsetta)	With conspicuous ventral fins.
VERRILLII (Lycenchelys)	In honor of Prof. Addison E. Verrill, of Yale University, a leader and pioneer in American deep-sea research.
VIOLA (Antimora)	Violet-hued.
VIOLACEUS (Thyrsitops)	Of a violet color.
WILLOUGHBYI (Acrotus)	For Mr. Charles Willoughby, of Damon, Washington, who collected the type specimen.
ZEBRA (Psychrolutes)	Striped like a zebra.
ZOARCHUS (Lycodes)	Resembling the genus *Zoarces*.
ZONURUS (Malacottus)	With a band of color on the tail (*ζωνη* and *ουρα*).

OCEANIC ICHTHYOLOGY.

LIST OF PLATES AND FIGURES.

NOTE.—The actual size of the specimens from which the figures are drawn may, in most instances, be determined by the use of the inch mark beneath the engraving, which in the photographic reduction of the drawing is reduced in the same proportion as the drawing itself. Where this is not present, the scale of reduction is approximately indicated in this list of plates, except in the case of outlines copied from published figures and of large species of very variable length, such as the sharks and rays. Where no reference to length appears either upon the plate or in the list of figures, it may be assumed that the figure is of natural size, or nearly so.

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PLATE XXX.

111. **Maurolicus borealis**, (Nilsson), Günther 96
Drawing by A. H. Baldwin, from a specimen collected by the steamer *Albatross*, at Station 2102, in N. lat. 28° 36′, W. lon. 85° 33′, at a depth of 111 fathoms.

112. **Opisthoproctus soleatus**, Vaillant 95
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XIV, Fig. 1. (Nearly four times natural size.)

113. **Ichthyococcus ovatus**, (Cocco), Bonaparte 95
Outline from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XIV, Fig. 2.

114. **Cyclothone microdon**, (Günther), Goode and Bean 99
Drawing by H. L. Todd, from No. 29833, U. S. N. M., collected by the steamer *Fish Hawk*, at Station 953, off Marthas Vineyard, in N. lat. 39° 52′ 30″, W. lon. 70° 17′ 30″, at a depth of 724 fathoms. (Nearly twice natural size.)

PLATE XXXI.

115. **Chauliodus Sloanii**, Schneider 96
Drawing by H. L. Todd, from No. 23420, U. S. N. M., collected by Capt. Charles Anderson and crew, of the Gloucester fishing fleet, in N. lat. 42 08′, W. lon. 65 35′, at a depth of 185 fathoms. (About one-half natural size.)

116. **Gonostoma denudatum**, Rafinesque 98
Drawing from Bonaparte, Fauna Italica, folio 119, Fig. 1.

117. **Gonostoma brevidens**, Kner and Steindachner 98
Drawing by H. L. Todd, from No. 33368, U. S. N. M., collected by the steamer *Albatross*, at Station 2077, in N. lat. 41° 09′ 40″, W. lon. 66° 02′ 20″, at a depth of 1,255 fathoms. (Slightly reduced.)

118. **Cyclothone bathyphila**, (Vaillant), Goode and Bean 100
Drawing by A. H. Baldwin, from a specimen collected by the steamer *Albatross*, at Station 2534, in N. lat. 40° 01′, W. lon. 67° 29′ 15″, at a depth of 1,234 fathoms.

PLATE XXXII.

119. **Cyclothone elongata**, (Günther), Goode and Bean 101
Drawing by A. H. Baldwin, from No. 33291, U. S. N. M., collected by the steamer *Albatross*, at Station 2039, in N. lat. 38° 19′ 26″, W. lon. 68° 20′ 20″, at a depth of 2,369 fathoms. (Nearly twice natural size.)

120. **Bonapartia pedaliota**, Goode and Bean 102
Drawing by H. L. Todd, from the type specimens, collected by the steamer *Albatross*, at Station 2642, in N. lat. 25° 20′ 30″, W. lon. 79° 58′, at a depth of 217 fathoms. (Enlarged about one-half.)

Text page.

121. **Yarrella Blackfordii**, Goode and Bean 103
Drawing by A. H. Baldwin, from type No. 44242, U. S. N. M., collected by the steamer *Albatross*, at Station 2376, in N. lat. 29° 03′ 15″, W. lon. 88° 16″, at a depth of 324 fathoms. (Slightly reduced.)

122. **Photichthys argenteus**, Hutton 104
Drawing from Günther, Challenger Report, Vol. xxii, Pl. xlv. (About one-half natural size.)

PLATE XXXIII.

123. **Astronesthes niger**, Richardson 105
Drawing by A. H. Baldwin, from No. 34538, U. S. N. M., collected by Capt. Field, on a voyage from Mogador to New York, and presented to the National Museum by Mr. E. G. Blackford.

124. **Antronesthes gemmifer**, Goode and Bean 105
Drawing by A. H. Baldwin, from type No. 24645, U. S. N. M., obtained by the schooner *Polar Wave* from the stomach of a halibut, in N. lat. 44° 25′, W. lon. 53° 12′, at a depth of 300 fathoms.

125. **Astronesthes Richardsonii**, Poey 106
Drawing by M. M. Smith, from No. 35540, U. S. N. M., collected by the steamer *Albatross*, at Station 2202, in N. lat. 39° 38′ 00″, W. lon. 71° 39′ 45″, at a depth of 515 fathoms.

PLATE XXXIV.

126. **Diplophos tænia**, Günther 104
Drawing from Günther, Challenger Report, Vol. xxii, Pl. iv., (Enlarged nearly five times.)

127. **Stomias ferox**, Reinhardt 107
Drawing by H. L. Todd, from No. 23360, U. S. N. M. (Gloucester donation No. 490), collected by Capt. David Cammel and crew, of the Gloucester fishing fleet, at East Banquereux (Three-fifths natural size.)

128. **Stomias boa**, (Risso), Cuvier 108
Drawing from Cuvier and Valenciennes, Histoire Naturelle des Poissons, Vol. xviii, Pl. 545.

129. **Stomias affinis**, Günther 108
Drawing from Günther, Challenger Report, Vol. xxii, Pl. liv, Fig. A.

PLATE XXXV.

130. **Echiostoma barbatum**, Lowe 109
Drawing by S. F. Denton, from No. 35624, U. S. N. M., collected by the steamer *Albatross*, at Station 2236, in N. lat. 39° 11′ 00″, W. lon. 72° 08′ 30″, at a depth of 636 fathoms. (Enlarged one-third.)

131. **Echiostoma margarita**, Goode and Bean 109
Drawing by A. H. Baldwin, from type No. 39282, U. S. N. M., collected by the steamer *Albatross*, at Station 2394, in N. lat. 28° 38′ 30″, W. lon. 87° 02′, at a depth of 420 fathoms.

132. **Opostomias micripnus**, Günther 110
Drawing from Günther, Challenger Report, Vol. xxii, Pl. liii, Fig. A. (About one-half natural size.)

133. **Grammatostomias dentatus**, Goode and Bean 110
Drawing by H. L. Todd, from type No. 37370, U. S. N. M., collected by the steamer *Albatross*, at Station 2565, in N. lat. 38° 19′ 20″, W. lon. 69° 02′ 30″, at a depth of 2,069 fathoms. (Slightly enlarged.)

PLATE XXXVI.

134. **Pachystomias microdon** Günther 111
Outline from Günther, Challenger Report, Vol. xxii, Pl. liii.

135. **Eustomias obscurus**, Vaillant 111
Outline from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. viii, Fig. 3.

136. **Bathophilus nigerrimus**, Giglioli 111
Outline from Giglioli, "Pelagos." (Enlarged one-third.)

137. **Photonectes gracilis**, Goode and Bean 112
Drawing by M. M. Smith, from the type specimen collected by the steamer *Blake* at Station xl, off Martinique, in 472 fathoms.

PLATE XXXVII.

138. **Malacosteus niger**, Ayres 114
Drawing by H. L. Todd, from No. 32169 U. S. N. M. (Gloucester Donation, No. 797), collected by Capt. Charles Anderson and crew of the schooner *Alice G. Wonson*, on the northeastern edge of Georges Bank, in 125 fathoms. (Enlarged two-thirds.)

Text page.

139. **Malacosteus choristodactylus**, Vaillant........ 114
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. VIII. (Slightly enlarged.)

140. **Photostomias Guernei**, Collett........ 115
Outline from Lütken, Spolia Atlantica, p. 281. (Three and a half times natural size.)

141. **Thaumatostomias atrox**, Alcock........ 115
Drawing from Alcock, Annals and Magazine of Natural History, Vol. VI, Pl. VIII, Fig. 7.

PLATE XXXVIII.

142. **Alepisaurus ferox**, Lowe........ 117
Drawing by H. L. Todd, from No. 20593 U. S. N. M., obtained in a New York market by E. G. Blackford.

143. **Paralepis borealis**, (Reinhardt), Jordan and Gilbert........ 119
Drawing by H. L. Todd, from a specimen in the Academy of Natural Sciences, Montreal, Canada.

143A. **Paralepis coregonoides**, Risso........ 119
Outline from Bonaparte, Fauna Italica, Pl. XXVII.

144. **Sudis hyalina**, Rafinesque........ 121
Outline from Bonaparte, Fauna Italica, Pl. XXVII.

145. **Odontostomus hyalinus**, Cocco........ 121
Outline from Günther, Challenger Report, Vol. XXII, Pl. LII, Fig. A.

PLATE XXXIX.

146. **Sternoptyx diaphana**, Lowe........ 124
Drawing by H. L. Todd, from a specimen obtained by the steamer *Blake* at Station CCCXVI, in N. lat. 32° 07′, W. lon. 78° 37′ 30″, at a depth of 229 fathoms.

146B. **Sternoptyx diaphana**, Lowe........ 124
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake* at Station CCCXIII, in N. lat. 33° 19′, W. lon. 76° 12′ 30″, at a depth of 457 fathoms.

147. **Argyropelecus hemigymnus**, Cocco........ 126
Drawing by A. H. Baldwin, from a specimen collected by the steamer *Albatross* at Station 2117, in N. lat. 15° 24′ 40″, W. lon. 63° 31′ 30″, at a depth of 683 fathoms.

148. 148A. **Argyropelecus Olfersii**, (Cuvier), Cuvier and Valenciennes........ 126
Drawing by H. L. Todd, from No. 33393 U. S. N. M., collected at Station 2075, in N. lat 41° 40′ 30″, W. lon. 65° 35′ 00″, at a depth of 855 fathoms. (Natural size.)

149. **Polyipnus spinosus**, Günther........ 128
Drawing by H. L. Todd, from No. 37860 U. S. N. M., collected by the steamer *Albatross* at Station 2393, in N. lat. 28° 43′ 00″, W. lon. 87° 11′ 30″, at a depth of 525 fathoms. (Twice natural size.)

PLATE XL.

150. **Omosudis Lowei**, Günther........ 122
Outline from Günther, Challenger Report, Vol. XXII, Pl. LII.

151. **Idiacanthus ferox**, Günther........ 129
Outline from Günther, Challenger Report, Vol. XXII, Pl. LII, Fig. D.

152. **Halosaurus Oweni**, Johnson........ 130
Drawing by A. H. Baldwin, from No. 31118 U. S. N. M., collected by the steamer *Albatross* at station 2181, in N. lat. 39° 29′, W. lon. 71° 46′, at a depth of 693 fathoms.

153. **Halosaurus Johnsonianus**, Vaillant........ 131
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XV, Fig. 2.

PLATE XLI.

154. **Aldrovandria rostrata**, (Günther), Goode and Bean........ 132
Drawing from Günther, Challenger Report, Vol. XXII, Pl. LIX.

155. 155A. **Aldrovandia macrochira**, (Günther), Goode and Bean........ 133
Drawings by H. L. Todd, from a specimen collected by the steamer *Blake* at Station LIII, off Havana, in 242 fathoms.

156. **Aldrovandia phalacrus**, (Vaillant), Goode and Bean........ 134
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XVI.

PLATE XLII.

Text page.

157. **Aldrovandia gracilis**, Goode and Bean 134
Drawing by S. F. Denton, from a specimen collected by the steamer *Blake* at Station LXX, off Guadalupe, at a depth of 769 fathoms. (About one-half natural size.)

158. **Aldrovandia pallida**, Goode and Bean 135
Drawing by H. L. Todd, from the type specimen collected by the Steamer *Blake* at Station CLXXIII, in N. lat. 24° 36′, W. lon. 84° 05′, at a depth of 955 fathoms. (About seven-twelfths natural size.)

159. **Congermuræna flava**, Goode and Bean 138
Drawing by H. L. Todd, from a specimen collected by the steamer *Albatross* at Stations 2121 and 2122, between N. lat. 10° 37′ 40″, W. lon 61° 42′ 40″, and N. lat. 10° 37′ 00″, W. lon. 61° 44′ 22″, at a depth of 31 to 34 fathoms. (Five-sevenths natural size.)

160. **Uroconger vicinus**, Vaillant 138
Drawing by H. L. Todd, from a specimen collected by the steamer *Albatross* at Station 2161, in N. lat. 23° 10′ 36″, W. lon. 82° 20′ 28″, at a depth of 146 fathoms. (Slightly reduced.)

PLATE XLIII.

161. **Simenchelys parasiticus**, Gill 139
Drawing by H. L. Todd, from No. 21673, U. S. N. M., collected by Capt. N. McPhee, of the Gloucester fishing fleet, near Sable Island Bank. (Seven-tenths natural size.)

162. **Ilyophis brunneus**, Gilbert 141
Drawing by A. H. Baldwin, from type No. 44403, U. S. N. M., collected by the steamer *Albatross*, off the Galapagos Islands.

163. **Hoplunnis Diomedianus**, Goode and Bean 146
Drawing by J. C. Van Hook, from type No. 44240, U. S. N. M., collected by the steamer *Albatross* at Station 2402, in N. lat. 28° 36′, W. lon. 86° 50′, at a depth of 111 fathoms.

PLATE XLIV.

164. **Synaphobranchus pinnatus**, (Gronovius), Günther 143
Drawing by H. L. Todd, from No. 21681, U. S. N. M., collected by Capt. Olsen, of the Gloucester fishing fleet, on Le Have Bank. (Three-fifths natural size.)

165. **Histiobranchus infernalis**, Gill 145
Drawing by H. L. Todd, from No. 38205, U. S. N. M., collected by the steamer *Albatross* at Station 2727, in N. lat. 36° 35′, W. lon. 74° 03′ 30″, at a depth of 1239 fathoms.

166. **Pisoodonophis cruentifer**, Goode and Bean 147
Drawing by A. H. Baldwin, from No. 28938, U. S. N. M., collected by the steamer *Fish Hawk* at Station 1035, in N. lat. 39° 57′, W. lon. 69° 28′, at a depth of 120 fathoms. (Slightly reduced.)

167. **Myrus pachyrhynchus**, Vaillant 148
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. v, Fig. 1. (About one-half natural size.)

168. **Venefica procera**, (Goode and Bean), Jordan and Davis 149
Drawing by H. L. Todd, from a specimen collected by the *Blake* at Station CLIII, in N. lat. 16° 43′ 45″, W. lon. 62° 16′ 12″, at a depth of 303 fathoms. (Seven-twelfths natural size.)

169, 169A, B. **Derichthys serpentinus**, Gill 161
Drawings by H. L. Todd, from type No. 33523, U. S. N. M., collected by the steamer *Albatross*, at station 2094, in N. lat. 39° 44′ 30″, W. lon. 71° 04′, at a depth of 1,022 fathoms.

PLATE XLVI.

170. **Nemichthys scolopaceus**, Richardson 152
Drawing by H. L. Todd, from a specimen collected by William Parsons, on East Georges Bank.

171. **Labichthys carinatus**, Gill and Ryder 153
Drawing by A. H. Baldwin, from type No. 33369, U. S. N. M., collected by the steamer *Albatross*, at station 2076, in N. lat. 41° 13′, W. lon. 65° 33′ 30″, at a depth of 906 fathoms. (Slightly reduced.)

172. **Labichthys elongatus**, Gill and Ryder 153
Drawing by A. H. Baldwin, from type No. 33577, U. S. N. M., collected by the steamer *Albatross*, at station 2100, in N. lat. 39° 22′, W. lon. 68° 34′ 30″, at a depth of 1,628 fathoms.

PLATE XLVII.

Text page.

173. **Labichthys infans,** (Günther), Goode and Bean 153
Drawing by A. H. Baldwin, from type No. 44239, U. S. N. M., collected by the steamer *Albatross*, at station 2859, in N. lat. 55° 20', W. lon. 136° 20', at a depth of 1,569 fathoms. (About one-half natural size.)

174. **Labichthys infans** (after Günther) 154
Outline from Günther, Challenger Report, Vol. XXII, Pl. LXIII.

175. **Serrivomer Beanii,** Gill and Ryder 155
Drawing by A. H. Baldwin, from No. 33383, U. S. N. M., collected by the steamer *Albatross*, at station 2075, in N. lat. 41° 40' 30", W. lon. 65° 28' 30", at a depth of 855 fathoms. (About one and two-thirds natural size.)

PLATE XLVIII.

176. **Cyema atrum,** Günther 154
Drawing from Günther, Challenger Report, Vol. XXII, Pl. LXV, Fig. D. (About natural size.)

177. **Eurypharynx pelecanoides,** Vaillant 159
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XVII. (About one-half natural size.)

178. **Saccopharynx flagellum,** Mitchill 157
Drawing from Günther, Challenger Report, Vol. XXII, Pl. LXVI. (Enlarged about one-half.)

PLATE XLIX.

179, 180. **Saccopharynx flagellum,** Mitchill 157
Drawings by H. L. Todd, from No. 37988, U. S. N. M., collected by the steamer *Albatross*, at station 2717, in N. lat. 38° 21', W. lon. 71° 13', at a depth of 1,615 fathoms. (No. 179, one-third natural size; No. 180, one-half.)

181, 182. **Gastrostomus Bairdii,** Gill and Ryder 159
Drawings by H. L. Todd, from No. 33386, U. S. N. M., collected by the steamer *Albatross*, at station 2074, in N. lat. 41° 43', W. lon. 65° 21' 50", at a depth of 1,309 fathoms.

PLATE L.

183. **Notacanthus nasus,** Bloch 161
Drawing from Cuvier and Valenciennes, Histoire Naturelle des Poissons de la France, Pl. 241.

184. **Notacanthus analis,** Gill 165
Drawing by H. L. Todd, from type No. 37856, U. S. N. M., collected by the steamer *Albatross*, at station 2677, in N. lat. 32° 39', W. lon. 76° 50' 30", at a depth of 478 fathoms. (About one-half natural size.)

185. **Notacanthus Bonapartii,** Risso 166
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XXVII, Fig. 2. (Reduced about one-third.)

186. **Notacanthus phasganorus,** Goode 167
Drawing by H. L. Todd, from type No. 25972, U. S. N. M., collected by Capt. Briggs Gilpatrick, of the schooner *Gatherer*, from the stomach of a Ground-shark, on the Grand Bank of Newfoundland. (One-fourth natural size.)

PLATE LI.

187. **Gigliolia Moseleyi,** Goode and Bean 169
Drawing from Günther, Challenger Report, Vol. XXII, Pl. LXI, Fig. C. (*One-half natural size.*)

188. **Polyacanthonotus Rissoanus** (De Filippi and Verany), Günther 170
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XXVII.

189. **Macdonaldia rostrata,** (Collett), Goode and Bean 171
Drawing by M. M. Smith, from type No. 35601, U. S. N. M., collected by the steamer *Albatross*, at station 2216, in N. lat. 39° 47', W. lon. 70° 30' 30", at a depth of 963 fathoms.

190. **Lipogenys Gillii,** Goode and Bean 173
Drawing by H. L. Todd, from No. 39212, U. S. N. M., collected by the steamer *Albatross*, at station 2742, in N. lat. 37° 46' 30", W. lon 73° 56' 30", at a depth of 865 fathoms. (About one-half natural size.)

PLATE LII.

Text page.

191A, B. **Notacanthus analis**, Gill 165
Drawings by A. H. Baldwin, from No. 37856, U. S. N. M., collected by the steamer *Albatross*, at station 2677, in N. lat. 32° 39′, W. lon. 76° 50′ 30″, at a depth of 478 fathoms.

192A, B. **Notacanthus sexspinis**, Richardson 163
Drawings from Günther, Challenger Report, Vol. XXII, Pl. LXI, Fig. a.

193. **Gigliolia Moseleyi**, Goode and Bean 169
Drawing from Günther, Challenger Report, Vol. XXII, Pl. LXI, Fig. C.

194A, B. **Polyacanthonotus Rissoanus**, (De Filippi and Verany), Günther 170
Drawings from Günther, Challenger Report, Vol. XXII, Pl. LXI.

195A, B. **Macdonaldia rostrata**, (Collett), Goode and Bean 171
Drawings by A. H. Baldwin, from Nos. 35601–2, U. S. N. M., collected by the steamer *Albatross*, at station 2216, in N. lat. 39° 47′, W. lon. 70° 30′ 30″, at a depth of 963 fathoms.

196A, B. **Lipogenys Gillii**, Goode and Bean 173
Drawings by A. H. Baldwin, from No. 39212, U. S. N. M., collected by the steamer *Albatross*, at station 2742, in N. lat. 37° 46′ 30″, W. lon. 73° 56′ 30″, at a depth of 865 fathoms.

PLATE LIII.

197. **Beryx splendens**, Lowe 176
Drawing by M. M. Smith, from a specimen collected by the steamer *Albatross*, at station 2415, in N. lat. 30° 44′, W. lon. 79° 26′, at a depth of 440 fathoms.

198. **Melamphaes typhlops**, (Lowe), Günther 177
Drawing from Günther, Challenger Report, Vol. XXII, Pl. V, Fig. A.

199. **Scopelogadus cocles**, Vaillant 182
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XXVI. (Slightly reduced.)

200. **Poromitra capito**, Goode and Bean 183
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake*, at station CCCXXVIII, in N. lat. 34° 28′ 45″, W. lon. 75° 22′ 50″, at a depth of 1,632 fathoms. (Two and two-sevenths natural size.)

200A. **Plectromus crassiceps**, (Günther), Goode and Bean 180
Drawing from Günther, Challenger Report, Vol. XXII, Pl. VIII, Fig. B.

PLATE LIV.

201. **Plectromus suborbitalis**, Gill 179
Drawing by H. L. Todd, from type No. 33271, U. S. N. M., collected by the steamer *Albatross*, at station 2036, in N. lat. 38° 52′ 40″, W. lon. 69° 24′ 40″, at a depth of 1,735 fathoms. (One and three-fifths natural size.)

202. **Plectromus Beanii**, (Günther), Goode and Bean 179
Drawing by S. F. Denton, from No. 33378, U. S. N. M., collected by the steamer *Albatross*, at station 2075, in N. lat. 41° 40′ 30″, W. lon. 65° 35′, at a depth of 855 fathoms.

203. **Anoplogaster cornutus**, (Cuvier and Valenciennes), Günther 184
Drawing by H. L. Todd, from No. 33559, U. S. N. M., collected by the steamer *Albatross*, at station 2101, in N. lat. 39° 18′ 30″, W. lon. 68° 24′, at a depth of 1,686 fathoms.

PLATE LV.

204, 204A. **Caulolepis longidens**, Gill 185
Drawings by H. L. Todd, from No. 33270, U. S. N. M., collected by the steamer *Albatross*, at station 2034, in N. lat. 39° 27′ 10″, W. lon. 69° 56′ 20″, at a depth of 1,346 fathoms.

205. **Stephanoberyx Monæ**, Gill 186
Drawing by H. L. Todd, from No. 33415 U. S. N. M., collected by the steamer *Albatross* at station 2077, in N. lat. 40° 09′ 40″, W. lon. 66° 02′ 20″, at a depth of 1,255 fathoms. (About three times natural size.)

PLATE LVI.

206. **Stephanoberyx Gillii**, Goode and Bean 187
Drawing by H. L. Todd, from type No. 33555, U. S. N. M., collected by the steamer *Albatross* at station 2099, in N. lat. 37° 12′ 20″, W. lon. 69° 39′ 00″, at a depth of 2,949 fathoms

Text page.

207. **Trachichthys Darwinii**, Johnson 188
Drawing from Steindachner and Dœderlein, Denkschrift d. k. Akademie d. Wissenschaften Vol. XLVII, Pl. II.

208. **Hoplostethus mediterraneus**, Cuvier and Valenciennes 189
Drawing by A. H. Baldwin, from No. 43624, U. S. N. M., collected by the steamer *Albatross* at station 2659, in N. lat. 28° 32′, W. lon. 78° 42′, at a depth of 509 fathoms.

PLATE LVII.

209. **Thyrsitops violaceus**, Bean 195
Drawing by S. F. Denton, from type No. 39287, U. S. N. M., collected by Capt. Thomas Thompson, of the Gloucester fishing fleet, on Le Have Bank, at a depth of 125 fathoms. (One-seventh natural size.)

210. **Ruvettus pretiosus**, Cocco 198
Drawing by J. C. Van Hook, from a specimen collected by Capt. Thompson of the schooner *M. A. Baston* on Georges Bank.

211. **Epinnula magistralis**, Poey 198
Drawing by H. L. Todd, from No. 37238, U. S. N. M., collected by the steamer *Albatross* in the Carribbean Sea. (About one-third natural size.)

212. **Dicrotus parvipinnis**, Goode and Bean 201
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Albatross* at station 2601, off Cape Hatteras, in N. lat. 34° 39′ 15″, W. lon. 75° 33′ 30″, at a depth of 107 fathoms.

PLATE LVIII.

213. **Lepidopus caudatus**, (Euphrasen), White 203
Drawing by A. H. Baldwin, from No. 10115, U. S. N. M., collected by John Xantus, off Cape St. Lucas.

214. **Evoxymetopon tæniatus**, Poey 204
Drawing by H. L. Todd, from No. 5735, U. S. N. M., collected by Prof. Félipe Poey at Havana, Cuba. (About two-ninths natural size.)

215. **Benthodesmus atlanticus**, Goode and Bean 205
Drawing by H. L. Todd, from type No. 29116, U. S. N. M., taken from the stomach of a halibut, by Capt. R. Morrison, of the schooner *Laura Nelson*, on the west edge of the Grand Bank of Newfoundland, in 80 fathoms. (About one-third natural size.)

PLATE LIX.

216. **Aphanopus carbo**, Lowe 207
Outline from Günther, Challenger Report, Vol. XXII, Pl. VII, Fig. A.

217. **Trichiurus lepturus**, Linnæus 208
Drawing by H. L. Todd, from No. 18028, U. S. N. M., collected by Dr. Janeway, U. S. Navy, at St. Augustine, Fla.

218. **Pteraclis carolinus**, Cuvier and Valenciennes 212
Drawing by H. L. Todd, from No. 37861, U. S. N. M., collected by the steamer *Albatross* at station 2660, in N. lat. 28° 40′ 00″, W. lon. 78° 46′ 00″, at a depth of 504 fathoms. (Enlarged one-half.)

PLATE LX.

219. **Coryphæna hippurus**, Linnæus (old male) 209
Drawing by H. L. Todd, from No. 16182, U. S. N. M., obtained in Fulton Market, New York City, by E. G. Blackford.

220. **Coryphæna hippurus**, Linnæus (young) 209
Drawing by H. L. Todd, from No. 16184, U. S. N. M., obtained in the Fulton Market, New York City, by E. G. Blackford.

220.A, B. **Coryphæna hippurus**, Linnæus 209
Sketches from Lütken, Spolia Atlantica, I, p. 486.

PLATE LXI.

221. **Grammicolepis brachiusculus**, Poey 218
Copied from a drawing by Shufeldt, Journal of Morphology, Vol. II. (One-third natural size.)

Text page.

222. **Centrolophus pompilus**, (Gmelin), Cuvier and Valenciennes 214
Drawing by S. F. Denton, from a specimen obtained at Dennis, Mass., by Vinal N. Edwards. (About two-thirds natural size.)

223. **Schedophilus medusophagus**, Cocco 214
Drawing from Günther, Transactions of the Zoölogical Society of London, Vol. XI. Pl. LXVII.

PLATE LXII.

224. **Icosteus enigmaticus**, Lockington 215
Drawing by Günther, Challenger Report, Vol. XXII, Pl. XLIV. (Slightly reduced.)

225. **Acrotus Willoughbyi**, Bean 217
Drawing by S. F. Denton, from No. 39340, U. S. N. M., collected off the coast of Washington, by Charles Willoughby. (About one-ninth natural size.)

226. **Icichthys Lockingtonii**, Jordan and Gilbert 216
Drawing by A. H. Baldwin, from No. 27397, U. S. N. M., collected off the coast of Washington. (Slightly reduced.)

PLATE LXIII.

227. **Nomeus Gronovii**, (Gmelin), Günther 220
Drawing by H. L. Todd, from a specimen collected by the steamer *Albatross* at station 2647, in N. lat. 25° 48′ 00″, W. lon. 80° 04′ 00″, at a depth of 85 fathoms. (Enlarged one-third.)

228. **Psenes pellucidus**, Lütken 221
Drawing by M. M. Smith, from No. 35415, U. S. N. M., collected by the steamer *Albatross* at station 2171, in N. lat. 37° 59′ 30″, W. lon. 73° 48′ 40″, at a depth of 444 fathoms.

229. **Psenes maculatus**, Lütken 221
Drawing by H. L. Todd, from No. 39329, U. S. N. M., collected by the steamer *Albatross* at station 2628, in N. lat. 32° 24′, W. lon. 76° 55′ 30″, at a depth of 528 fathoms. (Nearly twice natural size.)

PLATE LXIV.

230. **Luvarus imperialis**, Rafinesque 222
Outline from Day, Fishes of Great Britain and Ireland, Pl. XLIII.

231. **Glossamia pandionis**, Goode and Bean 231
Drawn by H. L. Todd, from type No. 26628, U. S. N. M., collected by the steamer *Fish Hawk* at station 897, in N. lat. 37° 25′, W. lon. 74° 18′, at a depth of 157½ fathoms. (Enlarged about one-fourth.)

232. **Verilus sordidus**, Poey 240
Drawing by A. H. Baldwin, from No. 12565, U. S. N. M., collected by Prof. Félipe Poey, off Cuba. (Slightly less than one-half natural size.)

PLATE LXV.

233, 233A, B. **Cyttus hololepis**, Goode and Bean 225
Drawings by H. L. Todd, from type No. 39296, U. S. N. M., collected by the steamer *Albatross* at station 2358, in N. lat. 20° 19′, W. lon. 87° 03′ 30″, at a depth of 220 fathoms. (Enlarged nearly one-half.)

234. **Diretmus argenteus**, Johnson 211
Drawing from Johnson, Proceedings of the Zoölogical Society of London, Pl. XXXVI.

235. **Antigonia capros**, Lowe 229
Drawings from Temminck and Schlegel, Fauna Japonica, Pl. XLII.

PLATE LXVI.

236. **Epigonus occidentalis**, Goode and Bean 233
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Blake* at station LIV, off Barbadoes, in 237 fathoms. (Natural size.)

237. **Hypoclydonia bella**, Goode and Bean 236
Drawing by S. F. Denton, from No. 39338, U. S. N. M., collected by the steamer *Albatross* at station 2426, in N. lat. 36° 01′ 30″, W. lon. 74° 47′ 30″, at a depth of 93 fathoms. (About one and two-thirds natural size.)

238. **Polyprion americanum**, (Schneider), Jordan 238
Drawing by H. L. Todd, from a specimen collected by the U. S. Fish Commission, on the Grand Bank.

Text page

239, 240. **Pseudopriacanthus altus**, Gill 242
Drawings by H. L. Todd, from a specimen collected by the steamer *Albatross* at station 2606, in N. lat. 34° 35′ 15″, W. lon. 75° 52′ 00″, at a depth of 25 fathoms. (No. 239, eight times natural size; No. 240, four times.)

PLATE LXVII.

241. **Polymixia nobilis**, Lowe 243
Drawing from Günther, Challenger Report, Vol. XXII, Pl. I, Fig. B.

242. **Scorpæna cristulata**, Goode and Bean 246
Drawing by H. L. Todd, from type No. 39326, U. S. N. M., collected by the steamer *Albatross* at station 2415, in N. lat. 30° 44′, W, lon. 79° 26, at a depth of 440 fathoms.

243. **Scorpæna Agassizii**, Goode and Bean 247
Drawing by M. M. Smith, from the type specimen collected by the steamer *Blake* at station CCLIX, in N. lat. 23° 13, W. lon. 71° 52, at a depth of 80 fathoms.

PLATE LXVIII.

244. **Helicolenus maderensis**, Goode and Bean 250
Drawing by H. L. Todd, from No. 26627, U. S. N. M., collected by the steamer *Fish Hawk* at station 897, in N. lat. 37 25′, W. lon. 71° 18, at a depth of 157½ fathoms. (Slightly reduced.)

245. **Pontinus Rathbuni**, Goode and Bean 255
Drawing by A. H. Baldwin, from No. 39526, U. S. N. M., collected by the steamer *Albatross* at station 2298, in N. lat. 35° 39′, W. lon. 71 52′, at a depth of 80 fathoms.

246. **Pontinus longispinis**, Goode and Bean 258
Drawing by H. L. Todd, from type No. 39322, U. S. N. M., collected by the steamer *Albatross* at station 2102, in N. lat. 28° 36′, W. lon. 85° 33′ 30, at a depth of 111 fathoms.

PLATE LXIX.

247. **Pontinus macrolepis**, Goode and Bean 257
Drawing by A. H. Baldwin, from a specimen collected by the steamer *Blake* at station CIV, off Barbadoes, at a depth of 500 fathoms.

248. **Sebastes marinus**, (Linnæus), White 260
Drawing by H. L. Todd, from No. 10412, U. S. N. M. collected at Eastport, Me.

PLATE LXX.

249. **Setarches parmatus**, Goode 264
Drawing by H. L. Todd, from type No. 26084, U. S. N. M., collected by the steamer *Fish Hawk* at station 876, off Martha's Vineyard, in N. lat. 39 57′ 00″, W. lon. 70 56′ 00″, at a depth of 120 fathoms. (Twice natural size.)

250. **Eumicrotremus spinosus**, (Müller), Gill 272
Drawing by H. L. Todd, from a specimen collected off Half Way Rock, Salem, Mass., at a depth of 35 fathoms. (About three times natural size.)

251, 251A, B. **Careproctus ranula**, Goode and Bean 275
Drawings by H. L. Todd, from No. 22310, U. S. N. M., collected by the steamer *Speedwell* at station 117, off the mouth of Halifax Harbor. (Little less than twice natural size.)

252. **Monomitra liparina**, Goode 278
Drawn by H. L. Todd, from type No. 26184, U. S. N. M., collected by the steamer *Fish Hawk* at station 891, in N. lat. 39° 46′, W. lon. 71 10′, at a depth of 480 fathoms.

PLATE LXXI.

253. **Paraliparis Copei**, Goode and Bean 279
drawing by H. L. Todd, from No. 35637, U. S. N. M., collected by the steamer *Albatross* at station 2232, in N. lat. 39° 12′ 17″, W. lon. 72° 09′ 30″, at a depth of 520 fathoms. (Slightly reduced.)

254. **Gymnolycodes Edwardsi**, Vaillant 281
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XXVI.

255. **Artediellus uncinatus**, (Reinhardt), Jordan 267
Drawing by A. H. Baldwin, from a specimen collected by the steamer *Albatross* at station 2477, in N. lat. 44° 29′ 30″, W. lon. 57° 11′ 15″, at a depth of 114 fathoms. (About two-and-a-half times natural size.)

Text page.

256. **Triglops Pingelii**, Reinhardt 269
Drawing by H. L. Todd, from a specimen collected by the steamer *Speedwell* at station 117, 8 miles off Chebucto, at a depth of 52 fathoms. (Enlarged about one-half.)

PLATE LXXII.

257. **Cottunculus microps**, Collett 269
Drawing by H. L. Todd, from No. 26087, U. S. N. M., collected by the steamer *Fish Hawk* at station 880, in N. lat. 38° 48′ 30″, W. lon. 70° 54′, at a depth of 252½ fathoms. (Natural size.)

258. **Cottunculus Thomsonii**, Günther 270
Drawing by H. L. Todd, from No. 37386, U. S. N. M., collected by the steamer *Albatross* at station 2584, in N. lat. 39° 05′ 30″, W. lon. 72° 23′ 20″, at a depth of 541 fathoms. (Seven-twelfths natural size.)

259. **Podothecus decagonus**, (Schneider), Jordan 282
Drawing from Collett, Norsk. Nordhavs Expedition, Pl. ii, Fig. 11.

260. **Aspidophoroides monopterygius**, (Bloch), Goode and Bean 283
Drawing by H. L. Todd, from No. 21761, U. S. N. M., collected by the steamer *Speedwell* at Sandwich Point, Halifax, in 18 fathoms. (Enlarged about one-half.)

PLATE LXXIII.

261A. B. **Cottunculus microps**, Collett 269
Drawing by H. L. Todd, from No. 26087, U. S. N. M., collected by the steamer *Fish Hawk* at station 880, in N. lat. 38° 48′ 30″, W. lon. 70° 54′, at a depth of 252½ fathoms. (Natural size.)

262A, B. **Cottunculus Thomsonii**, Günther 270
Drawings by H. L. Todd, from No. 37386, U. S. N. M., collected by the steamer *Albatross* at station 2584, in N. lat. 39° 05′ 30″, W. lon. 72° 23′ 20″, at a depth of 541 fathoms. (Natural size.)

PLATE LXXIV.

263, 263A, B. **Hypsicometes gobioides**, Goode 290
Drawings by A. H. Baldwin, from a specimen collected by the steamer *Albatross* at station 2377, in N. lat. 29° 07′ 30″, W. lon. 88° 08′, at a depth of 210 fathoms.

264, 264A. **Chiasmodon niger**, Johnson 292
Drawings by H. L. Todd, from No. 25633, U. S. N. M., collected at the surface by Capt. Thomas F. Hodgdon of the schooner *Bessie W. Somes*, on Le Have Bank.

PLATE LXXV.

265. **Lopholatilus chamæleonticeps**, Goode and Bean 284
Drawing by H. L. Todd, from No. 22899, U. S. N. M., collected by Capt. Kirby, 80 miles south by east of No Man's Land.

PLATE LXXVI.

266. **Pseudoscopelus scriptus**, Lütken 292
Drawing from Lütken, Spolia Atlantica, Pl. i, Fig. 3. (About three times natural size.)

267. **Porichthys porosissimus**, (Cuvier and Valenciennes), Günther 294
Outline by A. H. Baldwin, from a specimen collected by the steamer *Albatross* at station 2121, in N. lat. 10° 37′ 40″, W. lon. 61° 42′ 40″ at a depth of 31 fathoms.

268, 268A, B. **Callionymus himantophorus**, Goode and Bean 296
Drawings by H. L. Todd, from a specimen collected by the steamer *Blake* at station xxx, off Barbados, in 209 fathoms. (Natural size.)

PLATE LXXVII.

269. **Anarrhichas lupus**, Linnæus 299
Drawing by H. L. Todd, from No. 21846, U. S. N. M., collected by Capt. John Gourville, of the Gloucester fishing fleet, on Georges Bank.

270. **Anarrhichas minor**, Olafsen 301
Drawing by H. L. Todd, from No. 21618, U. S. N. M., collected by Capt. R. H. Hurlbert, in N. lat. 42° 27′, W. lon. 64° 20′.

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271. **Anarrhichas latifrons**, Steenstrup and Hallgrimsson 301
Drawing by H. L. Todd, from No. 21373, U. S. N. M., collected by Capt. Joseph W. Collins, of the schooner *Marion*, in N. lat. 43° 56′, W. lon. 59° 04′. (About one-fourth natural size.)

PLATE LXXVIII.

272. **Lycodes Esmarkii**, Collett 303
Drawing by H. L. Todd, from No. 21991, U. S. N. M., collected by Capt. Z. Hawkins and crew, of the schooner *Gwendolen*, on Le Have Bank, in 400 fathoms. (About two-sevenths natural size.)

273. **Lycodes reticulatus**, Reinhardt 305
Drawing by H. L. Todd, collected by Capt. R. Markuson and crew, of the Gloucester fishing fleet, southwest of Banquereux, in 300 fathoms.

274. **Lycodes frigidus**, Collett 305
Drawing by H. L. Todd, from No. 32995, U. S. N. M., collected by the steamer *Albatross* at station 2018, in N. lat. 37° 12′ 22″, W. lon. 74° 20′ 04″, at a depth of 788 fathoms. (About two-fifths natural size.)

275. **Lycodes mucosus**, Richardson .... 306.
Drawing by H. L. Todd, from No. 16930, U. S. N. M., collected in Cumberland Gulf, by W. A. Mintzer. (About two-fifths natural size.)

PLATE LXXIX.

276. **Lycodes zoarchus**, Goode and Bean 308
Drawing by S. F. Denton, from type No. 39298, U. S. N. M., collected by steamer *Albatross*, off Nova Scotia in N. lat. 44° 46′ 30″, W. lon. 59° 55′ 45″, at a depth of 130 fathoms.

276A. **Lycodes zoarchus**, Goode and Bean 308
Drawing by S. F. Denton, from No. 39299, U. S. N. M., collected by the steamer *Albatross* at station 2486, in N. lat. 44° 26′, W. lon. 57° 11′ 15″, at a depth of 190 fathoms.

277, 277A. **Lycenchelys Verrillii**, Goode and Bean 309
Drawings by H. L. Todd, from No. 21015, U. S. N. M., collected by the U. S. Fish Commission, 27 miles southwest of Chebucto.

PLATE LXXX.

278. **Lycodes perspicillum**, Kröyer 307
Drawing by H. L. Todd, from No. 39336, U. S. N. M., collected by steamer *Albatross* at station 2456, in N. lat. 47° 29′, W. lon. 52° 18′, at a depth of 86 fathoms. (Twice natural size.)

278A. **Lycodes perspicillum**, Kröyer 307
Drawing by S. F. Denton, from No. 39337, U. S. N. M., collected by the steamer *Albatross* at station 2491, in N. lat. 45° 25′ 30″, W. lon. 58° 35′ 15″, at a depth of 59 fathoms. (Nearly four times natural size.)

279. **Lycenchelys paxillus**, Goode and Bean 311
Drawing by H. L. Todd, from No. 22177, U. S. N. M., collected by Capt. Joseph Collins, of the Gloucester fishing fleet, in N. lat. 42° 48′, W. lon. 63° 07′. (About one-half natural size.)

279A. **Lycenchelys paxillus**, Goode and Bean 311
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake* at station CCCIX, in N. lat. 40° 11′ 40″, W. lon. 68° 22′, at depth of 304 fathoms.

280. **Lycodonus mirabilis**, Goode and Bean 312
Drawing by S. F. Denton, from No. 39207, U. S. N. M., collected by the steamer *Albatross* at station 2742, in N. lat. 37° 46′ 30″, W. lon. 73° 56′ 30″, at a depth of 865 fathoms.

PLATE LXXXI.

281A, B. **Lycodes reticulatus**, Reinhardt 305
Drawing by H. L. Todd, from a specimen collected by Capt. R. Markuson, southwest of Banquereux, in 300 fathoms. (One-half natural size.)

282. **Lycenchelys paxillus**, Goode and Bean 311
Drawing by H. L. Todd, from No. 22177, U. S. N. M., collected by Capt. Joseph W. Collins of the Gloucester fishing fleet, in N. lat. 42° 48′, W. lon. 63° 07′. (Natural size.)

Text page.

283A, B. **Lycodes mucosus**, Richardson 306
Drawings by H. L. Todd, from No. 16930, U. S. N. M., collected by W. A. Mintzer, in Cumberland Gulf. (Three-fourths natural size.)

283C. **Lycodes zoarchus**, Goode and Bean 308
Drawing by H. L. Todd, from type No. 39298, U. S. N. M., collected by the steamer *Albatross*, off Nova Scotia, in N. lat. 44° 46′ 30′, W. lon. 59° 55′ 45″, at a depth of 130 fathoms.

PLATE LXXXII.

284. **Melanostigma gelatinosum**, Günther 314
Drawing by H. L. Todd, from No. 28853, U. S. N. M., collected by the steamer *Fish Hawk* at station 952, in N. lat. 39° 55′, W. lon. 70° 28′, at a depth of 396 fathoms. (Enlarged one-half.)

285. **Dicromita Agassizii**, Goode and Bean 319
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake* at station XCIII, off Granada, in 291 fathoms.

285A, B. **Dicromita Agassizii**, Goode and Bean 319
Drawings by H. L. Todd, from type No. 26023, U. S. N. M., collected by the steamer *Fish Hawk* at station 869, in N. lat. 40° 02′ 18″, W. lon. 70° 23′ 06″, at a depth of 192 fathoms.

286. **Bassozetus catena**, Goode and Bean 323
Drawing by S. F. Denton, from type No. 37341, U. S. N. M., collected by the steamer *Albatross* at station 2379, in N. lat. 28° 00′ 15″, W. lon. 87° 42′, at a depth of 1,467 fathoms. (About seven-ninths natural size.)

287. **Bassozetus normalis**, Gill 322
Drawing by H. L. Todd, from No. 49416, U. S. N. M., collected by the steamer *Albatross* at station 2380, in N. lat. 28° 02′ 30″, W. lon. 87° 43′ 45″, at a depth of 1,430 fathoms. (About seven-tenths natural size.)

288. **Benthocometes robustus**, Goode and Bean 327
Drawing by H. L. Todd, from No. 29057, U. S. N. M., collected by the steamer *Fish Hawk* at station 1043, in N. lat. 38° 39′, W. lon. 73° 11′, at a depth of 130 fathoms. (One and three-fifths natural size.)

PLATE LXXXIII.

289. **Neobythites Gillii**, Goode and Bean 325
Drawing by A. H. Baldwin, from type No. 37340, U. S. N. M., collected by the steamer *Albatross* at station 2402, in N. lat. 28° 36′, W. lon. 85° 33′, at a depth of 111 fathoms. (About twice natural size.)

290. **Neobythites marginatus**, Goode and Bean 326
Drawing by H. L. Todd, from the the type specimen collected by the steamer *Blake* at station LXXIX, off Barbadoes, in 209 fathoms. (One and three-fifths natural size.)

291. **Bassogigas Gillii**, Goode and Bean 328
Drawing by A. H. Baldwin, from No. 39417, U. S. N. M., collected by the steamer *Albatross* at station 2684, off Cape Henlopen, Delaware, in N. lat. 39° 35′, W. lon. 70° 54′, at a depth of 1,106 fathoms. (Slightly more than one-third natural size.)

292. **Porogadus miles**, Goode and Bean 334
Drawing by A. H. Baldwin, from type No. 35625, U. S. N. M., collected by the steamer *Albatross* at station 2230, in N. lat. 38° 27′, W. lon. 73° 02′, at a depth of 1,168 fathoms. (Enlarged about one-half.)

PLATE LXXXIV.

293. **Penopus Macdonaldi**, Goode and Bean 336
Drawing by S. F. Denton, from type No. 39433, U. S. N. M., collected by the steamer *Albatross* at Station 2716, in N. lat. 38° 29′ 30″, W. lon. 70° 57′, at a depth of 1,631 fathoms.

294. **Barathrodemus manatinus**, Goode and Bean 332
Drawing by H. L. Todd, from the type specimen collected by the steamer *Blake* at station CCCXXV, in N. lat. 33° 35′ 20″, W. lon. 76°, at a depth of 647 fathoms. (Slightly enlarged.)

Text page.

295. **Nematonus pectoralis**, (Goode and Bean), Günther........ 333
Drawing by S. F. Denton, from type No. 37342, U. S. N. M., collected by the steamer *Albatross* at station 2380, in N. lat. 28° 02′ 30″, W. lon. 87° 43′ 45″, at a depth of 1,430 fathoms. (Slightly reduced.)

296A. **Mixonus laticeps**, Günther........ 339
Drawing from Günther, Challenger Report, Vol. XXII, Pl. XXV, Fig. B. (Five and a half times natural size.)

296B. **Tauredophidium Hextii**, Alcock........ 336
Outline from Alcock, Ann. & Mag. Nat. Hist., S. 6, Vol. VI, Pl. VIII, Fig. 1. (Nearly twice natural size.)

PLATE LXXXV.

297, 297A, B. **Dicrolene intronigra**, Goode and Bean........ 338
Drawings by H. L. Todd, from a specimen collected by the steamer *Blake* in the Gulf Stream. (No. 297, three-fourths natural size; Nos. 297A, B, natural size.)

298. **Barathronus bicolor**, Goode and Bean........ 341
Drawing by M. M. Smith, from the type specimen collected by the steamer *Blake*, at station LXXI, off Guadeloupe, in 769 fathoms.

299. **Aphyonis mollis**, Goode and Bean........ 342
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Blake* at station CCXXI, in N. lat. 24° 36′, W. lon. 84° 05′, at a depth of 955 fathoms.

PLATE LXXXVI.

300. **Alexeterion parfaiti**, Vaillant........ 343
Outline from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XXV (enlarged). (Four times natural size.)

301. **Hephthocara simum**, Alcock........ 344
Outline from Alcock, Annals and Magazine of Natural History, 1892, Pl. XVIII, Fig. 1. (Natural size.)

302. **Lamprogrammus niger**, Alcock........ 344
Drawing from Alcock, Annals and Magazine of Natural History, 1891, VIII, Fig. 2. (One-half natural size.)

303. **Rhodichthys regina**, Collett........ 342
Outline from Collett, Norsk. Nordhavs Exped. Fiske, Pl. V.

PLATE LXXXVII.

304. **Ptilichthys Goodei**, Bean........ 302
Drawing by H. L. Todd, from No. 26619, U. S. N. M., collected by Dall and Bean at the entrance to Port Levasheff, Unalaska, in 10 fathoms. (About twice natural size.)

305. **Otophidium omostigma**, Jordan........ 345
Drawing by H. L. Todd, from No. 29670, U. S. N. M., taken from the stomach of a red snapper at Pensacola, Fla. (Nearly twice natural size.)

306. **Leptophidium cervinum**, Goode and Bean........ 346
Drawing by H. L. Todd, from type No. 28764, U. S. N. M., collected by the steamer *Fish Hawk* at station 941, in N. lat. 40° 01′, W. lon. 69° 56′, at a depth of 76 fathoms. (About four-fifths natural size.)

307. **Leptophidium profundorum**, Gill........ 347
Drawing by A. H. Baldwin, from a specimen collected by the steamer *Albatross* at station 2042, in N. lat. 39° 33′, W. lon. 68° 26′ 45″, at a depth of 1,555 fathoms. (Slightly enlarged.)

308. **Leptophidium marmoratum**, Goode and Bean........ 348
Drawing by M. M. Hildebrant, from type No. 37237, U. S. N. M., collected by the steamer *Albatross*, at station 2350, in N. lat. 23° 10′ 39″, W. lon. 82° 20′ 21″, at a depth of 213 fathoms. (Slightly reduced.)

PLATE LXXXVIII.

309. **Phycis regius**, (Walbaum), Jordan and Gilbert........ 357
Drawing by H. L. Todd, from No. 20923, U. S. N. M., obtained in New York City, by E. G. Blackford. (Two-thirds natural size.)

Text page.

310. **Phycis cirratus**, Goode and Bean 358
Drawing by H. L. Todd, from type No. 39059, U. S. N. M., collected by the steamer *Albatross*, at station 2376, in N. lat. 29° 03′ 15″, W. lon. 88° 16′, at a depth of 324 fathoms.

311. **Phycis chuss**, (Walbaum), Gill 359
Drawing by H. L. Todd, from No. 28707, U. S. N. M., collected by the steamer *Fish Hawk*, at station 918, in N. lat. 40° 20′ 24″, W. lon. 70° 41′ 30″, at a depth of 245 fathoms.

PLATE LXXXIX.

312. **Phycis tenuis**, (Mitchill), De Kay 359
Drawing by H. L. Todd, from No. 21029, U. S. N. M., collected by the steamer *Speedwell*, at stations 73 and 74, in Halifax Harbor.

313. **Phycis Chesteri**, Goode and Bean 360
Drawing by H. L. Todd, from No. 21840, U. S. N. M., collected by the steamer *Speedwell*, at station 174, off Cape Ann, in 140 fathoms. (About two-thirds natural size.)

314. **Aprion macrophthalmus**, (Müller), Jordan and Swain 239
Drawing by M. M. Smith, from a specimen collected by the steamer *Blake*, at station CCLXI, in N. lat. 23° 13′, W. lon. 89° 10′, at a depth of 84 fathoms.

PLATE XC.

315. **Læmonema barbatula**, Goode and Bean 362
Drawing by W. S. Haines, from No. 38331, U. S. N. M., collected by the steamer *Albatross*, at station 2397, in N. lat. 28° 42′, W. lon. 86° 36′, at a depth of 280 fathoms.

315A. **Læmonema barbatula**, Goode and Bean 362
Drawing by H. L. Todd, from No. 29046, U. S. N. M., collected by the steamer *Fish Hawk*, at station 1045, in N. lat. 38° 35′, W. lon. 73° 13′, at a depth of 312 fathoms.

316. **Læmonema melanurum**, Goode and Bean 363
Drawing by W. S. Haines, from type No. 38270, U. S. N. M., collected by the steamer *Albatross* at station 2415, in N. lat. 30° 44′, W. lon. 79° 26′, at a depth of 440 fathoms.

317. **Molva vulgaris**, Fleming 364
Outline from Day, Fishes of Great Britain and Ireland, Pl. LXXXVI.

PLATE XCI.

318. **Physiculus Kaupi**, Poey 366
Outline from Günther, Challenger Report, Vol. XXII, Pl. XVII.

319. **Physiculus fulvus**, Bean 366
Drawing by H. L. Todd, from type No. 28766, U. S. N. M., collected by the steamer *Fish Hawk*, at station 941, in N. lat. 40° 01′, W. lon. 69° 56′, at a depth of 59 fathoms.

320. **Uraleptus Maraldi** (Risso), Costa 367
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake*, at station LXXXI, off Neris. (Nearly twice natural size.)

PLATE XCII.

321. **Lotella maxillaris**, Bean 368
Drawing by H. L. Todd, from type No. 29832, U. S. N. M., collected by the steamer *Fish Hawk*, at station 952, in N. lat. 39° 55′, W. lon. 70° 28′, at a depth of 396 fathoms. (Nearly three times natural size.)

322. **Mora mediterranea**, Risso 369
Outline from Bonaparte, Fauna Italica, Vol. III, Pl. 107.

323. **Lepidion Rissoi**, Swainson 370
Outline from Vinciguerra, Ann. Mus. Civ. Genoa, Vol. XVIII, Pl. III.

PLATE XCIII.

324. **Antimora viola** (Goode and Bean), Jordan 372
Drawing by H. L. Todd, from type No. 21837, U. S. N. M., collected by Capt. Joseph W. Collins, of the schooner *Marion*, on the edge of Le Have Bank. (Three-eighths natural size.)

Text page.

325. **Halargyreus brevipes**, Vaillant 375
Drawing from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. xxv. (About one-third natural size.)

326. **Strinsia tinca**, Rafinesque 380
Outline from Bonaparte, Fauna Italica, Vol. III, Pl. 107.

PLATE XCIV.

327. **Onos ensis**, (Reinhardt), Gill 381
Drawing by S. F. Denton, from No. 39821, U. S. N. M., collected by the steamer *Albatross*, at station 2550, in N. lat. 39° 44′ 30″, W. lon. 70° 30′ 45″, at a depth of 1,081 fathoms.

328. **Rhinonemus cimbrius**, (Linnæus), Goode and Bean 384
Drawing by H. L. Todd, from No. 2,721 U. S. N. M., collected in Chaleur Bay, by Edward Brown. (About three times natural size.)

329. **Brosmius brosme**, (Müller), Günther 385
Drawing by H. L. Todd, from No. 28867, U. S. N. M., obtained in a Boston market, by W. A. Wilcox.

PLATE XCV.

330. **Merlucius bilinearis**, (Mitchill), Gill 386
Drawing by H. L. Todd, from No. 21016, U. S. N. M., obtained by the U. S. Fish Commission in a Halifax market.

331. **Bregmaceros atlanticus**, Goode and Bean 388
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake*, at station CXIII, off Neris, in 305 fathoms. (Three and a half times natural size.)

332, 333. **Cœlorhynchus occa**, Goode and Bean 400
Drawing by H. L. Todd, from type No. 37334 U. S. N. M., collected by the steamer *Albatross*, at station 2396, in N. lat. 28° 34′, W. lon. 86° 48′, at a depth of 335 fathoms. (One-half natural size.)

PLATE XCVI.

334. **Macrurus berglax**, Lacépède 391
Drawing by H. L. Todd, from No. 15608, U. S. N. M. (Gloucester donation 490), collected on the eastern part of Banquereux, at a depth of 200 fathoms, by Capt. David Campbell and crew of the schooner *Admiral*. (One-fourth natural size.)

335. **Macrurus Bairdii**, Goode and Bean 393
Drawing by H. L. Todd, from No. 21014, U. S. N. M., taken 40 miles east of Thatcher's Island, at a depth of 160 fathoms. (About two-thirds natural size.)

336. **Cælorhynchus carminatus**, Goode 398
Drawing by H. L. Todd, from No. 26187, U. S. N. M., collected by the steamer *Fish Hawk*, at station 893, off Marthas Vineyard, in 372 fathoms. (Seven-twelfths natural size.)

337. **Cœlorhynchus occa**, Goode and Bean 400
Drawing by H. L. Todd, from type No. 37334, U. S. N. M., collected by the steamer *Albatross*, at station 2396, in N. lat. 28° 34′, W. lon. 86° 48′, at a depth of 335 fathoms. (Seven-twelfths natural size.)

PLATE XCVII.

338. **Cœlorhynchus caribbæus**, Goode and Bean 401
Drawing by H. L. Todd, from type No. 37333, U. S. N. M, collected by the steamer *Albatross*, at station 2377, in the northern part of the Gulf of Mexico, in N. lat. 29° 07′ 30″, W. lon. 88° 08′, at a depth of 210 fathoms. (About two-thirds natural size.)

339. **Coryphænoides carapinus**, Goode and Bean 404
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake*, at station CCXLII, in N. lat. 39° 43′, W. lon. 70° 55′ 25″, at a depth of 1,002 fathoms.

340. **Hymenocephalus Goodei**, (Günther), Bean 407
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake*, at station 56, in N. lat. 23° 09′, W. lon. 82° 21′ 30″, at a depth of 175 fathoms. (Four-fifths natural size.)

341. **Hymenocephalus cavernosus**, Goode and Bean 408
Drawing by S. F. Denton, from type No. 37337, U. S. N. M., collected by the steamer *Albatross*, at station 2398, in N. lat. 28° 45′, W. lon. 86° 26′, at a depth of 227 fathoms. (Slightly enlarged.)

PLATE XCVIII.

Text page.

342. **Lionurus filicauda**, Günther 409
Outline from Günther, Challenger Report, Vol. XXII, Pl. XXXIV.

343. **Trachonurus sulcatus**, Goode and Bean 410
Drawing by A. H. Baldwin, from type No. 37335, U. S. N. M., collected by the steamer *Albatross*, at station 2394, in N. lat. 28° 38′ 30″, W. lon. 87° 02′, at a depth of 420 fathoms. (Slightly enlarged.)

344. **Cetonurus globiceps**, Vaillant 411
Outline from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XX, Fig. 1.

345. **Chalinuras imula**, Goode and Bean 412
Drawing by H. L. Todd, from No. 39152 U. S. N. M., collected by the steamer *Albatross*, at station 2095, in N. lat. 39° 29′, W. lon. 70° 58′ 40″, at a depth of 1,342 fathoms.

PLATE XCIX.

345A. **Chalinura mediterranea**, Giglioli 525
Outline by Prof. H. H. Giglioli, from a specimen in the Central Collection of Italian Vertebrata, Royal Zoölogical Museum, Florence, Italy. (Slightly reduced.)

346. **Nematonurus gigas**, (Vaillant), Goode and Bean 416
Outline from Günther, Challenger Report, Vol. XXII, Pl. LX.

347. **Moseleya longifilis**, (Günther), Goode and Bean 417
Outline from Günther, Challenger Report, Vol. XXII, Pl. XXXV.

PLATE C.

348. **Abyssicola macrochira**, (Günther), Goode and Bean 417
Outline from Günther, Challenger Report, Vol. XXII, Pl. XXIX, Fig. B.

349. **Trachyrhynchus scabrus**, (Rafinesque), Goode and Bean 417
Outline from Günther, Challenger Report, Vol. XXII, Pl. XLI, Fig. C.

349A. **Macrurus longifilis**, Günther 417
Outline from Günther, Challenger Report, Vol. XXII, Pl. XXXV.

PLATE CI.

350. **Macrurus Novæ-zelandiae**, (Hector), Günther 418
Outline from Hector. Transactions of the New Zealand Institute, Vol. III, Pl. XVIII.

351. **Steindachneria argentea**, Goode and Bean 419
Drawing by H. L. Todd, from type No. 37350, U. S. N. M., collected by the steamer *Albatross*, at station 2378, in N. lat. 39° 14′ 30″, W. lon. 88° 09′ 30″, at a depth of 68 fathoms. (About four-fifths natural size.)

352. **Bathygadus favosus**, Goode and Bean 420
Drawing by H. L. Todd, from the type specimen collected by the steamer *Blake*, at station LXXX, off Martinique, in 472 fathoms. (About one-half natural size.)

353, 354. **Cœlorhynchus carminatus**, Goode 398
Drawings by H. L. Todd, from No. 26187, U. S. N. M., collected by the steamer *Fish Hawk*, at station 893, off Marthas Vineyard, in 372 fathoms. (Natural size.)

PLATE CII.

355A, B. **Limanda Beanii**, Goode 428
Drawings by H. L. Todd, from No. 26102, U. S. N. M., collected by the the steamer *Fish Hawk*, at stations 875, 876, off Marthas Vineyard, in 120 to 126 fathoms. (About four-fifths natural size.)

355C, D. **Limanda Beanii**, Goode 428
Drawings by H. L. Todd, from a specimen collected by the steamer *Albatross*, at station 2401, in N. lat. 28° 38′ 30″, W. lon. 85° 52′ 30″, at a depth of 142 fathoms. (Enlarged about one-half.)

356A. **Glyptocephalus cynoglossus**, (Linnæus), Gill 430
Drawing by S. F. Denton, from No. 39487, U. S. N. M., collected by the steamer *Albatross*, at station 2552, in N. lat. 39° 47′ 07″, W. lon. 70° 35′, at a depth of 721 fathoms. (Natural size.)

356B. **Glyptocephalus cynoglossus**, (Linnæus), Gill 430
Drawing by S. F. Denton, from a specimen collected by the steamer *Albatross*, at station 2543, in N. lat. 39° 58′ 15″, W. lon. 70° 42′ 30″, at a depth of 166 fathoms. (Natural size.)

PLATE CIII.

Text page.

357A, B. **Monolene sessilicauda**, Goode.......... 452
Drawings by H. L. Todd, from No. 26120, U. S. N. M., collected by the steamer *Fish Hawk*, off Newport, R. I. (About five-sevenths natural size.)

358. **Monolene atrimana**, Goode and Bean.......... 455
Drawing by H. L. Todd, from the type specimen collected by the steamer *Blake*, at station xvi, off Barbados, in 288 fathoms. (About four-fifths natural size.)

359. **Monolene atrimana**, Goode and Bean.......... 455
Drawing by H. L. Todd, from No. 26005, U. S. N. M., collected by the steamer *Fish Hawk*, at stations 871 and 872, off Marthas Vineyard, in 86 to 115 fathoms. (Natural size.)

PLATE CIV.

360. **Etropus rimosus**, Goode and Bean.......... 450
Drawing by H. L. Todd, from type No. 37332, U. S. N. M., collected by the steamer *Albatross*, at station 2408, in N. lat. 28° 28′, W. lon. 84° 25′, at a depth of 21 fathoms. (Enlarged about one-half.)

361. **Etropus rimosus**, Goode and Bean.......... 450
Drawing by H. L. Todd, from a specimen collected by the steamer *Albatross* at station 2543, upon the surface, in N. lat. 39° 58′ 15″, W. lon. 70° 42′ 30″, at a depth of 166 fathoms. (Three times natural size.)

362. **Notosema dilecta**, Goode and Bean.......... 437
Drawing by H. L. Todd, from a specimen collected by the steamer *Albatross*, at the surface, at Station 2601, in N. lat. 34° 39′ 15″, W. lon. 75° 33′ 30″, at a depth of 107 fathoms. (Twice natural size.)

PLATE CV.

363. **Hippoglossus vulgaris**, Fleming.......... 434
Drawing by H. L. Todd, from No. 10439, U. S. N. M., collected by the U. F. Fish Commission, at Eastport, Me.

364. **Platysomatichthys hippoglossoides**, (Walbaum), Goode and Bean.......... 435
Drawing by H. L. Todd, from a specimen obtained in Fulton Market, New York City.

PLATE CVI.

365A, B. **Notosema dilecta**, Goode and Bean.......... 437
Drawings by H. L. Todd, from a specimen collected by the steamer *Blake*, at station cccxiii, off Charleston, S. C., in N. lat. 32° 31′ 50″, W. lon. 78° 45′, at a depth of 75 fathoms. (Slightly reduced.)

366A, B. **Citharichthys arctifrons**, Goode.......... 442
Drawings by H. L. Todd, from a specimen collected by the steamer *Fish Hawk*, off Newport, R. I., in 115 to 155 fathoms. (Slightly enlarged.)

PLATE CVII.

367. **Hippoglossoides platessoides**, (Fabricius), Gill.......... 438
Drawing by H. L. Todd, from No. 21002, U. S. N. M., collected by the U. S. Fish Commission, on Le Have Bank.

368. **Cyclopsetta fimbriata**, Goode and Bean.......... 451
Drawing by H. L. Todd, from type No. 37330, U. S. N. M., collected by the steamer *Albatross*, at Station 2403, in N. lat. 28° 42′ 30″, W. lon. 85° 29′, at a depth of 88 fathoms. (Seventenths natural size.)

PLATE CVIII.

369A B. **Citharichthys unicornis**, Goode.......... 444
Drawings by H. L. Todd, from type No. 26003, U. S. N. M., collected by the steamer *Fish Hawk*, at stations 870, 871, off Marthas Vineyard, in 115 to 155 fathoms. (Enlarged about one-half.)

370. **Citharichthys spilopterus**, Günther.......... 447
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake*, at station ccxliv, in N. lat. 23° 13′, W. lon. 89° 10′, at a depth of 84 fathoms. (Slightly reduced.)

371. **Scianectes macrophthalmus**, Alcock.......... 440
Copied from Alcock, Journal of the Asiatic Society of Bengal, Vol. lviii, Pt. 2, Pl. xvi, Fig. 4.

PLATE CIX.

Text page.

372. **Trichopsetta ventralis**, (Goode and Bean), Gill 440
Drawing by H. L. Todd, from No. 37372, U. S. N. M., collected by the steamer *Albatross*, at station 2378, in N. lat. 29° 13′ 30″, W. lon. 88° 09, 30″, at depth of 68 fathoms. (Slightly enlarged.)

373. **Citharichthys pætulus**, (Goode and Bean), Jordan and Gilbert 448
Drawing by H. L. Todd, from type No. 30180, U. S. N. M., collected by Silas Stearns, at Pensacola, Fla. (About one-half natural size.)

PLATE CX.

374. **Aphoristia fasciata**, Goode and Bean 458
Drawing by H. L. Todd, from No. 37348, U. S. N. M., collected by the steamer *Albatross*, at Jamaica, West Indies.

375. **Aphoristia nebulosa**, Goode and Bean 458
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Blake*, at station CCCXQI, in N. lat. 32° 07′, W. lon. 78° 37′ 30″, at a depth of 229 fathoms.

376. **Aphoristia marginata**, Goode and Bean 459
Drawing by H. L. Todd, from a specimen collected by the steamer *Albatross*, at station 2376, in N. lat. 29° 03′ 15″, W. lon. 88° 16′, at a depth of 324 fathoms. (Slightly enlarged.)

377. **Aphoristia pigra**, Goode and Bean 460
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Blake*, at station XXIII, off St. Kitt's, West Indies, in 250 fathoms.

378. **Aphoristia diomediana**, Goode and Bean 460
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Albatross*, at station 2414, in N. lat. 25° 04′ 30″, W. lon. 82° 59′ 15″, at a depth of 26 fathoms. (About two-thirds natural size.)

379. **Aphoristia pusilla**, Goode and Bean 461
Drawing by H. L. Todd, from No. 28778, U. S. N. M., collected by the steamer *Fish Hawk*, in N. lat. 40° 01′, W. lon. 69° 56′, off Marthas Vineyard, in 179 fathoms. (About seven-tenths natural size.)

PLATE CXI.

380. **Prionotus militaris**, Goode and Bean 464
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Albatross*, at station 2362, off Cape Catoche, Yucatan, in N. lat. 22° 08′ 30″, W. lon. 86° 53′ 30″, at a depth of 25 fathoms.

381. **Prionotus egretta**, Goode and Bean 465
Drawing by M. M. Smith, from a specimen collected by the steamer *Blake*, at station LXIV, off Barbadoes, in 100 to 200 fathoms.

382. **Prionotus alatus**, Goode and Bean 467
Drawing by H. L. Todd, from a specimen collected by the steamer *Blake*, off Charleston, S. C., in N. lat. 32° 31′ 50″, W. lon. 78° 45′, at a depth of 75 fathoms.

PLATE CXII.

383, 383B. **Prionotus trinitatis**, Goode and Bean 468
Drawings by H. L. Todd, from type No. 39318, U. S. N. M., collected by the steamer *Albatross*, at station 2120, off Trinidad, in N. lat. 11° 07′, W. lon. 62° 14′ 30″, at a depth of 73 fathoms.

384. **Prionotus militaris**, Goode and Bean 464
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Albatross*, at Station 2362, off Cape Catoche, Yucatan, in N. lat. 22, ° 08′ 30″, W. lon. 86° 53′ 30″, at a depth of 25 fathoms.

PLATE CXIII.

385, 385A, B. **Peristedion miniatum**, Goode 470
Drawings by H. L. Todd, from type No. 26023, U. S. N. M., collected by the steamer *Fish Hawk*, at station 869, in N. lat. 40° 02′ 18″, W. lon. 70° 23′ 06″, at a depth of 192 fathoms. (No. 385 reduced about one-half; Nos. 385A, B natural size.)

PLATE CXIV.

Text page.

386. **Peristedion longispatha**, Goode and Bean 472
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Blake*, at station LVIII., off Havana, in 242 fathoms. (About seven-ninths natural size.)

387. **Peristedion gracile**, Goode and Bean 473
Drawing by H. L. Todd, from the type specimen, collected by the steamer *Albatross*, at station 2401, in N. lat. 28° 38′ 30″, W. lon. 85° 52′ 30″, at a depth of 112 fathoms.

388A, B. **Peristedion platycephalum**, Goode and Bean 474
Drawings by H. L. Todd, from the type specimen, collected by the steamer *Blake*, at station LX, off Barbados, in 123 fathoms. (Natural size.)

PLATE CXV.

389. **Lophotes Cepedianus**, Giorna 349
Drawing from Temminck and Schlegel, Fauna Japonica, Pl. LXXI, Fig. 2.

390. **Lophotes Capellei**, Temminck and Schlegel 351
Outline from Temminck and Schlegel, Fauna Japonica, Pl. LXXI.

391. **Trachypterus iris**, (Gmelin), Cuvier and Valenciennes 477
Outline from Cuvier and Valenciennes, Histoire Naturelle des Poissons de la France, Pl. 297.

PLATE CXVI.

392. **Trachypterus arcticus**, (Brünnich), Nilsson 479
Outline from Day, Fishes of Great Britain and Ireland, Vol. I, Pl. LXIII.

393. **Stylephorus chordatus**, Shaw 482
Outline from Blainville, Journal de Physique, Vol. LXXXVII, Pl. I.

394. **Stylephorus chordatus**, Shaw 482
Outline from Shaw, Transactions of the Linnean Society of London, Vol. I, p. 90.

PLATE CXVII.

395. **Regalecus glesne**, Ascanius 480
Outline from Day, Fishes of Great Britain and Ireland, Pl. 61.

396. **Macrorhamphosus scolopax**, (Linnæus), Goode and Bean 483
Drawing by H. L. Todd, from No. 28755, U. S. N. M., collected by the steamer *Fish Hawk*, at station 940, in N. lat. 39° 51′, W. lon. 69° 51′ 30″, at a depth of 130 fathoms. (Enlarged one fourth.)

397. **Aulostoma longipes**, Vaillant 481
Outline from Vaillant, Expeditions Scientifiques du Travailleur et du Talisman, Pl. XXVII, Fig. 4. (Eight times natural size.)

398. **Chaunax pictus**, Lowe 487
Drawing by H. L. Todd, from No. 26021, U. S. N. M., collected by the steamer *Fish Hawk*, at station 869, off Martha's Vineyard, in 192 fathoms. (Four times natural size.)

399. **Ceratias Holbölli**, Kröyer 489
Drawing from Gaimard, Voy. Skand., Poissons, Pl. IX.

PLATE CXVIII.

400, 400A, B. **Lophius piscatorius**, Linnæus 485
Drawings by S. F. Denton, from No. 39311, U. S. N. M., collected by the U. S. Fish Commission, 20 miles south of No Man's Land.

PLATE CXIX.

401. **Mancalias Shufeldtii**, Gill 490
Drawing by H. L. Todd, from No. 33552, U. S. N. M., collected by the steamer *Albatross*, at station 2099, in N. lat. 37° 12′ 20″, W. lon. 69° 39′, at a depth of 2,949 fathoms. (About two and a half times natural size.)

402. **Cryptopsaras Couesii**, Gill 491
Drawing by H. L. Todd, from No. 33558, U. S. N. M., collected by the steamer *Albatross*, at station 2101, in N. lat. 38° 13′ 30″, W. lon. 68° 24′, at a depth of 1,686 fathoms. (Three and three-fourths times natural size.)

Text page.

Halieutæa stellata, Cuvier and Valenciennes 499
Outline from Temminck and Schlegel, Fauna Japonica, Pl. 82.

Paroneirodes glomerosus, Alcock 493
Drawing from Alcock, Annals and Magazine of Natural History, Vol. II, Pl. IX, Fig. 6. (Very slightly reduced.)

PLATE CXX.

Corynolophus Reinhardtii, (Lütken), Gill 494
Drawing from Lütken, Vidensk. Selsk. Skr. Naturvid. og Math. Afh., IV, Pl. 334.

Melanocetus Johnsonii, Günther 494
Drawing by H. L. Todd, from No. 38055, U. S. N. M., collected by the steamer *Albatross*, at station 2149, in N. lat. 13° 01′ 30″, W. lon. 81° 25′, at a depth of 992 fathoms.

Liocetus Murrayi, Günther 495
Drawing from Günther, Challenger Report, Vol. XXII, Pl. XI.

PLATE CXXI.

Linophryne lucifer, Collett 496
Drawing from Collett, Proceedings of the Zoölogical Society of London, 1886, Pl. XV.

Caulophryne setosus, Goode and Bean 496
Drawing by S. F. Denton, from type No. 39265, U. S. N. M., collected by the steamer *Albatross*, in N. lat. 39° 27′, W. lon. 71° 15′, at a depth of 1,276 fathoms. (Nearly three times natural size.)

Halieutæa coccinea, Alcock 500
Drawing from Alcock, Annals and Magazine of Natural History, Series 6, Vol. VIII, Pl. VIII.

Malthopsis luteus, Alcock 529
Drawing from Alcock, Annals and Magazine of Natural History, Series 6, Vol. VIII, Pl. VIII.

PLATE CXXII.

B. **Halieutella lappa**, Goode and Bean 500
Drawings by H. L. Todd, from No. 31862, U. S. N. M., collected by the steamer *Fish Hawk*, at station 1151, in N. lat. 39° 58′ 30″, W. lon. 70° 37′, at a depth of 125 fathoms.

Dibranchus atlanticus, Peters 501
Drawings by H. L. Todd, from No. 26088, U. S. N. M., collected by the steamer *Fish Hawk*, at station 879, off Marthas Vineyard, in 225 fathoms. (No. 413A, natural size; No. 413B, enlarged one-third.)

B. **Halieutichthys aculeatus**, (Mitchill), Goode 504
Drawings by H. L. Todd, from No. 23552, U. S. N. M., collected at Key West, Fla., by J. W. Nelie. (Natural size.)

PLATE CXXIII.

Bathyclupea argentea, Goode and Bean 190
Drawing by A. H. Baldwin, from a specimen collected by the steamer *Blake*, at station XXXVII, off Neris, in 365 fathoms. (About one-half natural size.)

Schedophilopsis spinosus, Steindachner 216
Drawing by A. H. Baldwin, from a specimen obtained at Astoria, Oregon, by Dr. Aug. C. Kinney. (Four-fifths natural size.)

Tetragonurus Cuvieri, Risso 230
Drawing by M. M. Hildebrant, from No. 44436, U. S. N. M., collected at Woods Holl, Mass., by Vinal N. Edwards. (About two and a half times natural size.)

OCEANIC ICHTHYOLOGY

BASED UPON A STUDY OF

THE DEEP-SEA FISHES OF THE ATLANTIC BASIN.

BY GEORGE BROWN GOODE and TARLETON H. BEAN.

A DISCUSSION OF THE SPECIES AND THEIR DISTRIBUTION.

Class MARSIPOBRANCHII.

Marsipobranchii, BONAPARTE, Trans. Linn. Soc. London, v. 18, pp. 289, 304, 1841.
Marsipobranchia, GILL, Johnson's Cyclopædia, III, 316.
Dermopteri (part), OWEN, Anatomy of Vertebrates, I, 7.

Skeleton of a very inferior type, the notochord or embryonal vertebral column being persistent. Skull rudimentary and represented by a small brain case and capsules for the organs of sense (auditory and olfactory), as well as by an ethmovomerine plate; the inferior appendages developed as elements designated as the "subocular arch," with a metapterygoid or "superior quadrate" and an "inferior quadrate" portion, the "palato pterygoid" element, and the "stylohyal process;" labial cartilages form also a prominent feature of the skull; bones or cartilages, representing the upper as well as the lower jaws, entirely wanting; the branchial apparatus sustained by a basket-like skeleton; no limbs developed, and no scapular arch or pelvic girdle. Brain small but distinctly developed, differentiated into the brain proper and medulla oblongata; the former composed, as in the higher forms, of the "mesencephalon," "thalamencephalon," "prosencephalon," and "rhinencephalon;" the latter small, with a fourth ventricle conspicuous from above, and the "cerebellum" very rudimentary. Auditory apparatus quite simple, represented by a single membranous tube without any differentiation into canals and vestibules, as in the Hyperotreta, or, at most, as in the Hyperoartia, with two semicular canals and a sacculated vestibule. Olfactory apparatus consists of a median sac; is provided with but a single external aperture. Heart distinctly developed and divided into an auricle and ventricle, the former having in front a venous sinus, and the whole inclosed in a "pericardium," which connects with the peritoneal cavity. Intestinal canal simple; liver specialized as such, and kidneys well developed, with ureters opening behind into the rectum. Organs of generation without ducts, discharging into the abdomen, from which the products depart by an abdominal pore.

The species of the class are found in both fresh and salt waters, the Petromyzontids having members in the fresh and salt waters of all temperate and subtemperate countries; while the Myxinoids are represented in the cold waters of the northern hemisphere by *Myxine*, as well as along the shores of a considerable portion of the Pacific—in the Japanese and Chinese seas, California, Chile, and Australia.

Although no representatives of the class have been found in a fossil condition, their absence in the older strata is undoubtedly due rather to the difficulty connected with the preservation of the readily destructible cartilaginous skeleton than to their actual absence. It is indeed probable that the order was extensively represented in past times and that it was more abundantly developed than any other type. (*Gill.*)

Order HYPEROTRETA.

Cyclostomata hyperotreta, Müller, Abhandl. Akad. Wiss.
Hyperotreta, Gill, Johnson's Cyclopædia, II, 1079.

An order of marsipobranchiates characterized by the construction of the cranial cartilages and the complete tubulation of the median nasal aperture, and its perforation of the palate (hence the name). The branchial apertures are developed on each side far behind the head, and are variable in number; the inner branchial ducts communicate directly with the esophagus; the ova are large and each is provided with an oval horny case constricted at both ends, and with numerous filaments thereto. The embryology is still unknown. In the adult condition the mouth has no lips and no plates on the disk, but a median tooth is above the entrance of the esophagus, and two pectiniform rows of teeth on the tongue.

The order is composed of two families: (1) *Myxinidæ*, with one genus, *Myxine*, represented by species in the northern and southern hemispheres; and (2) *Bdellostomidæ*, whose species are confined to the Pacific Ocean, one of them ascending as far northward as California. (*Gill.*)

Family MYXINIDÆ.

Myxinidæ, Günther, Cat. Fish. Brit. Mus., VIII, 1870, 510.

MYXINE, Linnæus.

Myxine, Linnæus, Systema Naturæ, ed. x, I, 1758, 650 (type, *Myxine glutinosa*, L.).

Body eel-shaped, covered by a thin loose skin; two rows of mucous glands along the lower side. Eyes absent. Skull little developed, cartilaginous. Mouth lipless, suctorial, with barbels on each side. Nostril single, median, at front of head, with two pairs of barbels. Teeth strong, a single one on the roof of the mouth, and two rows on each side of the tongue. Gill sacs at the sides of esophagus near the left branchial opening; a third opening to esophagus and the branchial sacs. Ovary single, on right side. No oviducts.

MYXINE GLUTINOSA, Linnæus. (Figure 1.)

Myxine glutinosa, Linn., Syst. Nat., ed. x, I, 650; ed. xii, 1080.—Günther, Cat. Fish. Brit. Mus., VIII, 510.

A *Myxine* with 8–11 rather slender lingual teeth in each row, the two foremost strongest and more confluent at the base than the others. Length of head contained 3½ to 4 times in total length; tail 6½ to 10 times. Color grayish brown to bluish brown above, whitish below.

Linnæus included *Myxine* among his "*Vermes Intestina*," placing it between the leeches and the shipworms, and described its habits briefly as follows: "*Intrat et devorat pisces; aquam in gluten mutat*," and this sentence expresses nearly all that is known about the habits of the animal at the present time. It may be said, however, that it is found only in waters of low temperature, probably always below 50°, and that on account of its parasitic habits its capture is not likely to be effected except in connection with some larger fish on which it is preying. Its presence, therefore, is not certain to be detected by the trawl and dredge. The "slime-eel," as it is called, frequently penetrates into the abdominal cavity of other fishes to feed upon their flesh. It secretes thick, glutinous slime, in enormous quantities and with wonderful rapidity. A single hag will fill a two-gallon bucket with slime mingled with water in a few seconds, and after a slight interval can repeat the operation with ease. The eggs are elliptical in shape, and are supplied at each end with numerous short threads for adhesion. Nansen has made an exceedingly interesting investigation into the hermaphroditism of this form.

Myxine occurs only in the North Atlantic. On the coasts of Europe it is found in the Norwegian Fiords as deep as 70 fathoms, and it ranges as far south as Newcastle and the Firth of Forth. In the western Atlantic it is known to occur on the offshore banks as far north as the Grand Bank of Newfoundland, and probably still farther north through the Arctic Sea; and it also occurs on the shoals in the Bay of Fundy, one of the best known colonies being on the cod bank to the eastward of the north end of the island of Grand Manan. The fishermen of the offshore banks frequently pull them to the surface clinging to the fish taken on their hooks. In the deeper waters of the western Atlantic they have been found as far south as lat. 38° 31′, lon. 73° 25′, off the capes of Delaware by the Fish Commission at a depth of 126 fathoms, and off Cape Fear, North Carolina, lat. 34°, lon. 76° 10′, at a depth of 178 fathoms. Off Marthas Vineyard they have been found by the Fish Commission at a depth of 264 fathoms, with a temperature of 47°, and farther out at sea in the same region by the *Blake* at 304 fathoms (lat. 40° 11′ 40″, lon. 68° 22′), and 524 fathoms (lat. 41° 32′, lon. 65° 55′).

The form is so abundant off the New England coast in depths of 100 to 250 fathoms that a record of all the localities of its occurrence has not been kept. It is known, however, that specimens were obtained from the following stations of the *Blake*: 309, 306, and 327; and also from the following stations of the Fish Commission steamers: 869, 870, 871, 878, 939, 951, 1038, 1047, 1154, 2086, 2088, 2089, 2092.

MYXINE AUSTRALIS, JENYNS. (Figure 2.)

Myxine australis, JENYNS, Voyage of H. M. S. Beagle, Zoology (edited by Charles Darwin), 1839–'43; Fishes; 159; GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 511; Challenger Report, XXII, 1887, 267.
Heptatrema cirrhatum, SCHLEGEL, Fauna Japonica, Poissons, 310, pl. 143 (*fide* Günther).

A *Myxine* with ten or eleven slender teeth in each of the two series; the three foremost strongest and confluent at the base, the other teeth remaining separate; in the second series the two innermost teeth are confluent at the base.

M. australis was first described from Sandy Point and the Tyssen Island, at the southern extremity of South America. It was found by the *Challenger* in the Japanese Sea, where six specimens from 9 to 20 inches in length were taken on the *Hyalonema* ground at a depth of 345 fathoms (Station 232). Dr. Günther is of the opinion that *Heptatrema cirrhatum* Schlegel, from Japan, should be referred to the same species. The *Challenger* obtained specimens of *M. australis* from the Straits of Magellan, and the species is most probably an inhabitant of the deeper waters to the east of Patagonia, and entitled to a place in the fauna of the Atlantic basin.

Order HYPEROARTIA.

Cyclostomata hyperoartia, MÜLLER, Abhandl. Akad. Wiss., Berlin, 1834, 77.
Hyperoartia, GILL, Johnson's Cyclopædia, II, 1079.

An order of Marsipobranchiates distinguished by the development of the skull and the cœcal nature of the median external nasal aperture; no duct perforating the palate, which is, therefore, left entire (whence the name). The branchial apertures are on each side behind the head, and seven in number; the inner branchial ducts debouch into a separate common tube. The ova are small and superficially like those of fishes. The young undergo a complete metamorphosis after leaving the egg. The larvæ have an elongated slit like mouth, and are without teeth or eyes. In this condition they were formerly considered to be members of a peculiar group (*Ammocœtes*). At maturity the mouth is circular, surrounded

KEY TO THE ORDERS OF SELACHII.

I. Trunk more or less cylindrical, gradually tapering into the tail; gill openings lateral ....SQUALI (Sharks)
II. Trunk depressed (in typical genera the highly developed pectoral fins forming a broad flat disk); gill openings ventral ....RAIÆ (Skates and Rays)

Order SQUALI.

The Sharks.

Selachians, with body more or less cylindrical (sometimes much depressed anteriorly), gradually attenuating into the tail. *Branchial openings lateral*, slit-like, 5–7 in number, either entirely in front of or entirely behind the pectoral, opening over their bases. Pectorals moderately developed, distinctly differentiated from the sides.

KEY TO THE DEEP-SEA FAMILIES OF SQUALI.

I. Anal fin lacking.
  A. No spines in front of dorsal fins ....SCYMNORHINIDÆ
  B. Each dorsal fin preceded by a spine ....SPINACIDÆ
II. Anal fin present.
  A. Dorsal fins two, without antecedent spines, the first above or behind the ventrals.......SCYLLIIDÆ
  B. Dorsal fins two, without spines, the first in advance of ventrals; caudal crescentic, with a keel on each side of its stem; gill openings enormous.................................CETORHINIDÆ
  C. Dorsal fin single, without spine; caudal without notch posteriorly....... .....CHLAMYDOSELACHIDÆ

In this key only those families are included representatives of which have actually been taken at great depths. Other forms, such as *Selache maxima*, probably sink below the hundred-fathoms limit at times. Canestrini records as living "*in luoghi profondi*," in the Mediterranean, *Notidanus griseus*, *Heptanchus cinereus*, *Selache maxima*, and *Carcharodon Rondeletii*. *Spinax niger*, however, *Scymnus lichia*, and *Læmargus rostratus*, which dwell "*a grande profondita*," appear to be the only Mediterranean forms entitled to admission in this list, except perhaps *Centrophorus granulosus*, which it may be strays in from the deeps of the Atlantic, as far east as Sicily, and *Echinorhinus*.

Family SCYMNORHINIDÆ.

Scymnidæ, GILL, Johnson's Cyclopædia, IV, 158.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 13.
Spinacidæ (in part) GÜNTHER, Cat. Fish. Brit. Mus., VIII, 425–429.
Scymnorhinidæ, GILL, MS.

Scymnoid selachians, without anal fins and with spineless dorsals. Scales generally developed in the form of shagreen or fine bristly spines; head oval, depressed; eyes without nictitating membranes; nostrils with a simple anterior tag; mouth inferior and somewhat arched; teeth with trenchant edges; branchial apertures five, in advance of the pectorals; dorsals two, spineless, the first in advance of the ventrals, the second far behind; anal lacking; pectorals rather small; ventrals placed far back. (*Gill.*)

KEY TO THE GENERA OF SCYMNIDÆ.

I. First dorsal in advance of ventral. Lower teeth erect, triangular........................SCYMNORHINUS
  A. Dorsal fins similar in size. Lower teeth oblique, quadrate, with horizontal cutting edges..SOMNIOSUS
  B. Second dorsal longer than first. Upper teeth small, conical. Lower teeth larger, triangular, somewhat oblique...[EUPROTOMICRUS.—Indian Ocean.]
II. First dorsal opposite ventrals.
  C. Teeth equal in both jaws, large, very oblique, each with several small cusps. Skin with irregularly placed round osseous tubercles and prickles ....ECHINORHINUS
  D. Lower teeth much larger than upper, erect, not serrated. Skin granular. [ISISTIUS.—South Pacific and Gulf of Guinea.]

This family is not common in American waters. Of the three genera occurring in the Atlantic, one, *Scymnus*, has been found only in the Mediterranean and the adjacent parts of the Atlantic. *Somniosus* and *Echinorhinus* live chiefly in mid ocean, the former unquestionably breeding at considerable depth, though it is not certain that it descends below the hundred-fathom line. They are more abundant in the eastern Atlantic.

SCYMNORHINUS, Bonaparte.

Scymnus, CUVIER, Règne Animal, 1817, II, 130.—MÜLLER and HENLE, S. B. Plag., 92.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 426.

Two short dorsal fins without spine, the first at a considerable distance from the ventrals; no anal fin. Skin uniformly covered with minute scales. Mouth transverse, a deep, straight groove at each angle of the mouth. Nostrils at the extremity of the snout. Upper teeth small, pointed; lower much larger, dilated, erect, triangular, not very numerous. No membrana nictitans. Spiracles wide. Gill openings narrow. (*Günther.*)

SCYMNORHINUS LICHIA, BONAPARTE. (Figure 3.)

Squalus lichia, BONNATERRE, Tabl. Encycl. Ichth., 1788, 12.
Squale liche, LACÉPÈDE, Hist. Nat., I, 279, pl. X, fig. 3.
Scymnus lichia, BONAPARTE, Fauna Italica, III, fasc. XIV–XVI, 1836.—MÜLLER and HENLE, S. B. Plag., 92.—DUMÉRIL, Elasm., 452.—BOCAGE and CAPELLO, Peix. Plagiost., 31.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 425.—COLLETT, Bull. Soc. Zool. France, 219.

A *Scymnus* with seventeen or nineteen erect teeth in the lower jaw, with the edges serrated. Scales minute, with a median keel, and terminating in a point. The first dorsal fin is nearer to the root of the pectorals than to that of the ventrals.

This is the only species of the genus. It occurs in the western parts of the Mediterranean and about Madeira. It should be sought for by the fishermen on the Halibut banks.

SOMNIOSUS, Le Sueur.

Somniosus, LE SUEUR, Jour. Acad. Nat. Sci. Phila., 1818, I, 222 (type, *Somniosus brevipinna*, Le Sueur).—GILL, Proc. Acad. Nat. Sci. Phila., 1861, 261.—JORDAN, *loc. cit.*, 11.
Læmargus, MÜLLER and HENLE, S. B. Plag., 1838, 93. [Preoccupied in Crustacea by Kroyer.]
Rhinoscymnus (=*Somniosus* part), GILL, *loc. cit.*

Scymnoid sharks with body elongate and two spineless dorsals; fins all very small, the ventrals nearly opposite the second dorsal; mouth transverse, with deep groove backward from its angle; nostrils near the extremity of the snout; jaws feeble; teeth in upper jaw in several rows, small, narrow, conical; teeth in lower jaw numerous, in about six rows, the point so much turned aside that the inner margin forms a cutting edge; spiracles moderate; no nictitating membrane; gill openings narrow; skin uniformly covered with fine tubercles.

Two species are known; one, *S. rostratus*, recorded by Risso and Canestrini from the Mediterranean, off Nice and Genoa, where, according to Canestrini, it lives at great depths (Fauna d' Italia, Pesci, p. 43); the other, *S. microcephalus*, from the North Atlantic.

SOMNIOSUS MICROCEPHALUS, (SCHNEIDER), GOODE and BEAN (Figure 8.)

Squalus carcharias, MÜLLER, Zoologicæ Danicæ Prodromus, 1776, 38 (not Linnæus).
Squalus microcephalus, SCHNEIDER in Bloch, Syst. Ichth, 1801, 135.
Scymnus microcephalus, KRÖYER, Danmark's Fiske, III, 1853, 914, fig.—COLLETT, Norges Fiske, 212.—MALM. Fauna, 626.
Somniosus microcephalus, GOODE and BEAN, Bull. Essex Inst., 1877, 31.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 15.
Somniosus brevipinna, LE SUEUR, Journ. Acad. Nat. Sci. Phila., I, 1818, 122.—STORER, Rep. Fish. Mass., 189.
Scymnus brevipinna, DE KAY, Zoöl. N. Y., Fish., 361, pl. LXI, fig. 202.—STORER, Mem. Am. Acad. Sci., Boston, IX, 1867, 235, pl. XXXVIII, fig. 2.
Læmargus brevipinna, DUMÉRIL, Ichth., 456, pl. V, figs. 3–4.—MOREAU, Poiss. France, I, 361, fig. 63.
Squalus borealis, SCORESBY, Arctic Regions, 1820, I, 538, pl. XV, figs. 3–4.—JENYNS, Man. Brit. Vert. Anim., 1835, 506.

Scymnus borealis, Fleming, British Animals, 1828, 166.—Yarrell, Brit. Fish., 1st ed., II, 403, 2d ed., II, 527.—Swainson, Fishes, II, 315.—Nilsson, Skand. Fauna, IV, 724.—Thompson, Nat. Hist. Ireland, IV, 255.

Læmargus borealis, Müller and Henle, *op. cit.*, 1838, 93.—Gaimard, Voy. Groenland, Poiss., pl. XXII.—Yarrell, *op. cit.*, 3d ed., II, 524—Duméril, Ichth., I, 455, pl. V, figs. 1-2.—Günther, Cat. Fish. Brit. Mus., VIII, 426.

Scymnus borealis, Müller and Henle, *op. cit.*, 93.

Scymnus glacialis, Faber, Fische Islands, 1829, 23.—Nilsson, Prodr. Ichth. Skand., 116.

Scymnus Gunneri, Richardson, Fauna Boreali—Americana, III, 313.

Squalus norwegianus, Blainville, Faune Française, 61.

Squalus norvegicus, Gray, Gronow. Syst. Ichth., 8.

Scymnus micropterus, Valenciennes, Nouv. Ann. Mus., I, 1834, 451, pl. XX.

Leiodon echinatum, Wood, Proc. Bost. Soc. Nat. Hist., II, 174.

A *Somniosus* with body robust, rapidly tapering behind, its greatest depth about one-fifth its length; mouth transverse, moderate, with deep groove at its angle; upper jaw with five rows of small lancet-shaped teeth, lower jaw with about six rows of broad, quadrangular teeth, divided in their centers by a perpendicular ridge and directed outward; about twenty-six teeth on each side; spiracles present, small; skin with fine tubercles; fins small, the first dorsal about as large as the ventrals and larger than the second dorsal and both spineless; pectorals short; caudal short and bluntish

The Nurse Shark belongs to the northern parts of the North Atlantic and the Arctic Ocean. Twenty or more have been taken about the British Isles within the past century, chiefly along the northern shores, though one has been seen off Suffolk, and one in 1832 was found in the estuary of the Thames. In the western Atlantic it has not been seen south of Cape Cod. Three came ashore at Provincetown in 1848-'49, one at Portland, Me., in 1846, and one about Cape Ann before 1818, when Le Sueur saw and described its stuffed skin at Marblehead. About Greenland it is frequent near the shores, as it is also off Iceland and Norway, and the jaws are often seen in ethnographical collections, being used by the Eskimo to make a rude tiara-like headdress. Curiously enough, this sluggish shark is a determined enemy of the whale, and bites great lumps of flesh from its body, as Scoresby has recorded in his "Arctic Regions."

Somniosus descends to considerable depths, and, as Lütken has shown, deposits its numerous soft, globular eggs, devoid of protective covering, in the soft mud in the bottom of the deep sea.—[Lütken, Vid.-Medd., 1879-'80, pp. 56-61. Zoological Record, 1874. Day, Fishes of Great Britain and Ireland, II, 321].

Somniosus rostratus (*Scymnus rostratus*,. Risso=*Læmargus rostratus*, Canestrini), is a form recognized by Italian naturalists from a very few individuals observed about Nice and Genoa. It lives *a grande profondità* (Canestrini) and attains the length of 10 decimeters.

Family ECHINORHINIDÆ.

ECHINORHINUS, Blainville.

Echinorhinus, Blainville, Bull. Sci., 1816, 121; Faune Française, 66.—Bonaparte, Icon. Faun. Ital., III, fasc. XIII, 1836, No. 138.—Müller and Henle, S. B. Plag., 1841, 96.—Günther, Cat. Fish. Brit. Mus., VIII, 428.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 1883, 13.

Goniodus, Agassiz, Poiss. Foss., III [type *Goniodus spinosus*, pl. E, fig. 13].

Scymnoid sharks with two small spineless dorsal fins, the first opposite the ventrals; anal fins lacking, pectoral and caudal but slightly developed, the latter with no pit at its base. Mouth crescentic with a labial fold around its angle; nostrils midway between the mouth and the end of the snout. Teeth in both jaws very oblique with smooth cutting edges, the points being turned outward; two or more strong cusps on each side of the principal point. No nictitating membrane. Spiracles small; gill openings of moderate width. Skin with scattered, round, prickly tubercles, each leaving a scar when detached.

ECHINORHINUS SPINOSUS, (Gmelin), Blainville. (Figure 9.)

Squalus spinosus, Gmelin, in Linn., Syst. Nat., 1788, I, 1500.—Lacépède, Hist. Nat. Poiss., I, 283, pl. III, fig. 2.—Schneider, Syst. Ichth. of Bloch, 1801, 136.—Risso, Ichth. Nice, 42.

Scymnus spinosus, Cuvier, Règne Animal, 1817, ii, 131.—Risso, Hist. Nat. Eur. Mérid., Poiss., III, 130.

Echinorhinus spinosus, BLAINVILLE, Bull. Sci., 1816, 121.—Faune Française, 66.—BONAPARTE, Icon. Faun. Ital., Pesci, III, pl. CXXXVIII.—MÜLLER and HENLE, S. B. Plag., 96, pl. LX.—YARRELL, Brit. Fish., 2d ed., II, 532, fig.; 3d ed., II, 529.—COSTA, Fauna, Nap. Chond., XVI.—DUMÉRIL, Ichthyologie, I, 459.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 428.—GOODE and BEAN, Bull. Essex Institute, 1877, 31.—CANESTRINI, Fauna Italica, Pesci, 42.—JORDAN, *loc. cit.*, 13.—GIGLIOLI, Pesci Italici, Cat., 58; Elenco, 1883, 113.—DAY, Fishes Gt. Brit. & Ireland, II, 323, pl. CLXII, fig. 2.

Goniodus spinosus, AGASSIZ, Poiss. Foss., III, pl. E, fig. 13.

Centrophorus spinosus, SWAINSON, Fishes, II, 315.

Squalus brucus, BONNATERRE, Encyclopédie Méthodique.

Echinorhinus obesus, SMITH, Illustrations of the Zoölogy of South Africa, 1838–'42, Pisces, pl. I.

Spiracles behind the eye, behind the vertical from the angle of the mouth. Teeth $\frac{22-26}{22-26}$. Dorsal fins close together. Each tubercle with a small spine in the center. Brownish violet, with or without dark spots. (*Günther.*)

A single individual has been observed in the western Atlantic. This drifted ashore at Provincetown in December, 1878 (Goode and Bean, *loc. cit.*). In the Mediterranean it is rare, and lives at considerable depths (Canestrini, Fauna d' Italia, Pesci, p. 42). Risso mentions one weighing 400 pounds. Day records the occurrence of some thirty individuals in British waters since 1828, the largest 9 feet in length; this was a female and contained seventeen eggs, and was taken off the Eddystone in January, 1869. Since captures in this region have been made at all seasons of the year, it would appear that its breeding place and home is in the northeastern Atlantic, and that its infrequent capture is due to its habit of living on the offshore ledges and banks at considerable depths. As the synonymy shows, it was recorded by Smith from the Cape of Good Hope. It may be regarded as peculiar to the eastern part of the Atlantic Basin, the Cape Cod specimen being doubtless a waif.

Family SQUALIDÆ, Günther.

Spinacidæ, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 417–425.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 15.

Selachians with body somewhat elongate and head depressed; eyes lateral; nictitating membrane absent; mouth inferior, rather large, with a deep groove along either side; teeth compressed, varied; nostrils inferior, lateral, near the front margin of the snout; spiracles moderate; gill openings moderate, five on each side and all in front of the pectoral fins; dorsal fins two, each armed with a spine; the first dorsal in front of the pectorals; anal fin lacking; caudal fin with the lower lobe small or obsolete; ventrals far back.

Of the seven genera comprising this family only two, *Squalus* (= *Acanthias*) and *Oxynotus* (= *Centrina*), are shallow-water forms. Of these, all the species are represented in the Mediterranean. The family *Spinacidæ* is peculiarly characteristic of the Mediterranean fauna, all known species except three, one of which is from the northwestern Atlantic and two are from Japan, occurring in that sea or waters immediately adjacent. *Squalus* is the most cosmopolitan of the genera, but does not enter the North Pacific.

The deep-sea forms of these little sharks are especially abundant in the great depths outside the entrance to the Mediterranean, where an extensive fishery is carried on.

KEY TO THE GENERA OF

(Adapted from Vaillant.)

I. Trunk more or less rounded.
  A. Upper teeth bicuspid.
    1. Lower teeth oblique, with trenchant inner edges .... ETMOPTERUS
    2. Lower teeth tricuspid .... CENTROSCYLLIUM
  B. Upper teeth oblique, with trenchant inner edges; lower teeth similar...[SQUALUS.—Shallow water.]
  C. Upper teeth simple, pointed.
    1. Lower teeth more or less erect, triangular .... SCYMNODON
    2. Lower teeth oblique, with trenchant inner edges.
      a. Dorsal spines prominent; "upper teeth triangular," Vaillant .... CENTROPHORUS
      b. Dorsal spines hidden; "upper teeth conical," Vaillant .... CENTROSCYMNUS
    3. Lower teeth simple, straight .... PARACENTROSCYLLIUM*
II. Trunk rather elevated, trihedral. Teeth erect, conical in upper jaw; triangular, serrated in lower jaw. OXYNOTUS

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* A deep-sea genus from the Bay of Bengal, described by Alcock in Ann. and Mag. Nat. Hist., 1889, 379.

ETMOPTERUS, Rafinesque.

Spinax, CUVIER, Règne Animal, 1817, II, 129.—MÜLLER and HENLE, S. B. Plag., 1841, 86.
Acanthidium, LOWE, Proc. Zoöl. Soc., 1839, 91, (type, *A. pusillum* LOWE).—Fishes of Madeira, 1843–60, '40.

Spinacoid sharks, with two dorsal fins, each with a spine; no anal fin. Mouth but little arched; a long, deep, straight, oblique groove on each side of the mouth. Teeth of the lower jaw with the point so much turned aside that the inner margin of the tooth forms a cutting edge. Upper teeth erect, each with a long pointed cusp and one or two small ones on each side. No membrana nictitans. Spiracles wide, superior, behind the eye. Gill openings narrow.

North Atlantic, Mediterranean, and southeastern Pacific.

ETMOPTERUS SPINAX (LINNÆUS). (Figure 10.)

Spinax spinax, LINNÆUS, Syst. Nat., x, 1758, I, 233; XII, 1766, I, 398.
Spinax niger, BONAPARTE, Fauna Italica, Pesci, III, 1832–'41, fig. 1, pl. CXLI.—DUMÉRIL, Elasmobr., 441.—GÜNTHER, Cat., VIII, 424.—COLLETT, Norges Fiske, 1875, 215.—CAPELLO, Cat. Peix. Port. 1880, 49.

A *Spinax*, with scales tipped by short setiform spines, giving a villous appearance to the skin. First dorsal shorter than second, midway between the second dorsal and eye. Uniform brown or black, or with whitish longitudinal band along the side of the abdomen and of the tail. Caudal sometimes with white margin. (*Günther.*)

The little spinous dogfish with tricuspid teeth in its upper jaws has not yet been found in the western Atlantic. Unless the naturalists of Europe have been careless, its distribution on that coast is very remarkable. The Norwegians find it along their entire coast, from the Christiania Fiord to West Finmark (lat. 69° 30′), where it is abundant and produces young in midsummer. In the Mediterranean it is also abundant, occurring at great depths (*abita a grande profondità*, Canestrini), and it has also been taken in the Atlantic off Lisbon. We can find no record of its having been observed by French or English naturalists, unless it has been confounded with the other form of spiny dogfish—*Squalus acanthias*, L.,—which is abundant at both extremes of the recorded range of *Spinax spinax*, and is abundant in the Mediterranean as well as in Norway, and also on the American coast from New York (lat. 40° 30′) northward to Labrador and doubtless to Greenland. It is probable that a more careful search may reveal the presence of *Spinax* on the English and French coasts, and it may be in America.

Etmopterus spinax is replaced about Madeira by *E. pusillus*.

Etm. granulosus of Günther (Challenger Report VI, Shore Fishes, 19, pl. II, 2, fig. C), occurs on the southwest coast of South America, where a single specimen 10½ inches long was obtained by the *Challenger*.

ETMOPTERUS PUSILLUS (LOWE), J. & E. (Figure 5.)

Acanthidium pusillum, LOWE, Proc. Zoöl. Soc. London, 1839, 91.—Trans. Zoöl. Soc., III, 19.
Spinax pusillus, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 425.—VAILLANT, Voy. Travailleur and Talisman, 72.—COLLETT, Bull. Soc. Zoöl. France, XV, 1890, 219.
Spinax hillianus, POEY, Mem. Hist. Nat. Cuba, II, 340.—Rep. Fis. Nat. Cuba, 1868, 454 (*fide* Günther).

A *Spinax* with body smooth, scales very small, each with minute tuberosity, but without spines; the first dorsal fin much shorter than the second, midway between the second dorsal spine and the eye; tail relatively shorter than on *S. spinax*, its length less than the space between the snout and the origin of the pectorals; color brown. (*Günther.*)

The *Blake* took a single individual, believed to belong to this species, at Station CVIII, off St. Christopher, in 208 fathoms. It had previously been known only from Madeira and Cuba, the Cape Verdes, 290 fathoms (*Travailleur*), and the Bermudas (Goode). Lowe had five or six from Madeira, where it is not very rare, never exceeding a foot in length. The species is there taken "at moderate depths," but the line fisheries of Madeira are all at extraordinary depths below the surface.

The French expedition obtained an individual, 230 millimeters long, at Station CXI, in the channel of St. Vincent, St. Antoine, in the Cape Verde Islands, at a depth of 580 meters.

CENTROSCYLLIUM, Müller and Henle.

Centroscyllium, MÜLLER and HENLE, S. B. Plag., 1841, 191 [type *Spinax Fabricii* Reinhardt].—JORDAN and GILBERT, *loc. cit.*

Spinacoids with teeth equal in both jaws, small, straight, pointed, each with one or two smaller cusps on each side at base; mouth crescent-shaped, with a straight, oblique groove at angle; spiracles medium; branchial openings rather narrow; two dorsal fins, each with a strong spine; the second entirely behind the ventrals.

CENTROSCYLLIUM FABRICII, (REINHARDT), MÜLLER and HENLE. (Figure 7.)

Spinax fabricii, REINHARDT, Dansk. Vid. Selsk. Förh., III, 1828, XVI.
Centroscyllium fabricii, MÜLLER and HENLE, *op. cit.*, 191.—DUMÉRIL, Elasmobr., 449.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 425.—GOODE and BEAN, Bull. Essex Inst., XI, 1879, 30.—VAILLANT, Travailleur and Talisman, 73.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 6.

Body somewhat rounded, covered with minute stellate scales; dorsal fins short, each preceded by a strong spine; teeth in both jaws tricuspid, small; color, dark brown.

This little shark, previously known only from the coast of Greenland, has, since 1878, been found to be common on the offshore banks at depths of 150 or more fathoms in company with *Centroscymnus*. Vaillant's assignment of a specimen from the Banc d'Arguin, 750 fathoms, to this species, is at best very questionable.

A young individual, probably *C. Fabricii*, was taken at station 2377, February 11, 1885. Colors: "All the fins whitish, except caudal, which is yellowish; dorsals with a narrow black stripe anteriorly; tip and lower lobe of caudal with very broad black margin; iris greenish golden; sides with several lines made up of dark dashes."

CENTROSCYLLIUM GRANULATUM, GÜNTHER.

Centroscyllium granulatum, GÜNTHER, Challenger Report, XXII, 7.

This form is evidently, as Dr. Günther indicates, very closely allied to *Centroscyllium Fabricii*, having the same disposition of the fins, size of teeth, and dorsal spines, but the epidermoid productions of the head and body are much coarser and in the form of granulations, whilst in *Centroscyllium Fabricii* they are minute.

One specimen, 11 inches long, badly mutilated, was obtained by the *Challenger* at Port Stanley, Falkland Islands, station 311; depth 245 fathoms.

SCYMNODON, Bocage and Capello.

Scymnodon, BOCAGE and CAPELLO, Proc. Zoöl. Soc., 1864, 263 [type *S. ringens*, B. & C.].

Spinacoids, with teeth in upper jaw simply pointed, and teeth in lower jaw more or less erect, triangular. Scales leaf-shaped, with three strong ribs, each terminating in a point below. Dorsal fins small, low, each preceded by a small spine.

A single species, *S. ringens*, from deep waters off the coast of Portugal, has been described. [Bocage and Capello, *loc. cit.*—Günther, Cat. Fish. Brit. Mus., VIII, 423.]

SCYMNODON RINGENS, BOCAGE and CAPELLO. (Figure 12.)

Scymnodon ringens, BOCAGE and CAPELLO, P. Z. S., 1864, 263, fig. 5; Peix. Plagiost., I, pl. I, fig. 1.
Centrophorus ringens, GÜNTHER, Cat., VIII, 423.—CAPELLO, Jorn. Acad. Sc. Lisboa, II, 115, fig. of the teeth; Cat. Peix. Port., 1880, 49. Coasts of Portugal. Rare. (Lisbon and Setubal.)

A *Scymnodon* with labial groove extending for some distance along the margins of jaws. Upper teeth small, narrow, lanceolate; lower teeth more or less erect, triangular; the lateral ones somewhat inclined backward. Distance between nostrils one-half length of snout. Lower angle of pectoral rounded, not produced. Dorsal spines feeble, projecting but slightly beyond skin. First dorsal much shorter than second; length of base (without spine) about one-fourth of its distance from the second dorsal. Extremity of ventral fins behind end of the second dorsal. Scales pedunculate, each with three strong ribs, terminating in a point. Uniform brownish black. (Modified from *Günther*.)

CENTROPHORUS, (Müller and Henle), Bocage and Capello.

Centrophorus, Müller and Henle (part).—Günther (part), Cat. Fish. Brit. Mus., VIII, 419.
Centrophorus (restricted), Bocage and Capello, Proc. Zoöl. Soc., 1864, p. 263 [type *Centrophorus granulosus* (Schn.), M. and H.].

Spinacoid sharks, with two dorsal fins, each with a spine, which is sometimes hidden under the skin; no anal fin. Trunk elongate, without lateral folds. Mouth wide, but slightly arched; a long, deep, straight, oblique groove on each side of the mouth. Teeth of the lower jaw with the point more or less inclined backward or outward. Upper teeth erect, triangular, or narrow lanceolate, with a single cusp. No membrana nictitans. Spiracles wide, behind the eye. Gill openings narrow. (*Günther*.)

Centrophorus has not yet been taken in the western Atlantic, although six species have been found in the Mediterranean and the neighboring parts of the ocean, viz:

1. *Centrophorus granulosus* (Schn.), M. and H. Mediterranean and Madeira.
2. *Centrophorus lusitanicus*, Bocage and Capello. Off Portugal.
3. *Centrophorus crepidater*, Bocage and Capello. Off Portugal, Madeira.
4. *Centrophorus squamosus* (Gmelin), M. and H. Off Portugal.
5. *Centrophorus Dumerilii*, Johnson. Madeira.
6. *Centrophorus calceus*, Lowe. Madeira, off Portugal.

The French expedition obtained *C. squamulosus* in considerable numbers at Setubal, as well as two individuals of *C. calceus*. The *Challenger* did not obtain a single individual of the genus from the Atlantic, but took two undescribed forms, *C. foliaceus*, Günther, and *C. squamulosus*, Günther, off Japan, "an additional proof," remarks Günther, "of the extraordinary resemblance of the Japanese and Madeiran marine faunas."

CENTROPHORUS GRANULOSUS, Müller and Henle. (Figure 11.)

Centrophorus granulosus. Müller and Henle, Plagiost., 89, pl. 33.—Bocage and Capello, P. Z. S., 1868, 260; Peix., Plagiost., 25 (partim).—Capello, Jorn. Acad. Sci. Lisboa, II, 113 (partim); Cat. Peix. Port., 1880, 47.—Günther, Cat. VIII, 420.

The labial fold does not extend along the margin of the mouth. The distance between the nostrils is rather more than one-third the length of the præoral portion of the snout. The lower angle of the pectoral is produced into a narrow lobe, longer in adult examples than in immature. The length of the base of the second dorsal (without the spine) is two-thirds of that of the first (without the spine); and the length of the first (without the spine) is one-third of the distance between the two fins. Extremity of the ventral fins below the second dorsal spine. Scales rather smooth in adult examples, without median keel, ribbed in front. Young examples rough. Uniform brown; young examples with the extremities of the fins white. (*Günther*.)

This form occurs in the Mediterranean and the neighboring parts of the Atlantic.

The British Museum has a fœtus, which has been provided with a name by Dr. Bleeker (*Centrophorus moluccensis*, Act. Soc. Sc. Indo-Neerl., VIII, Amboyna, Indies). Dr. Günther says that no distinctive characters can be given from a single undeveloped example which is not in good condition.

CENTROPHORUS LUSITANICUS, Bocage and Capello.

Centrophorus lusitanicus, Proc. Zoöl. Soc., 1864, 260, fig. 1.—Bocage and Capello, Apuntamentos Ichth. de Portugal, Peixes Plagiost., Lisbon, 1866, 230.—Günther, Cat., VIII, 421.—Capello Cat. Peix. Port., 1880. Coast of Portugal.

Very similar to *C. granulosus*, but with base of the first dorsal fin much longer, etc.

The labial fold extends a little way along the margins of the mouth. The distance between the nostrils is rather more than one-third of the length of the præoral portion of the snout. Teeth without serrature. The lower angle of the pectoral fin is produced into a tapering lobe. The length of the base of the second dorsal (without the spine) is one-half of that of the first (without the spine); and the length of the base of the first (without the spine) is one-half of the distance between the two fins. Extremity of the ventral fins below the hind part of the second dorsal fin. *Scales rather smooth, without median keel, finely striated.* Uniform brownish. (*Günther.*)

This species has been found only off the coast of Portugal.

CENTROPHORUS CREPIDATER, BOCAGE and CAPELLO.

Centrophorus crepidater, BOCAGE and CAPELLO, Proc. Zoöl. Soc., 1864, 262, fig. 3.—Peix. Plagiost., 27, pl. 2, fig. 2.—CAPELLO, Jorn. Acad. Sci. Lisboa, II, 144.—GÜNTHER, Cat., VIII, 421.—CAPELLO, Cat. Peix. Port., 1880, 48.

Labial groove prolonged forward, nearly meeting in the median line of the snout. Upper teeth very small, narrow lanceolate. The distance between the nostrils is about two fifths of the length of the præoral portion of the snout. Lower angle of the pectoral rounded, not produced. Dorsal fins short, nearly equal in length; the length of the base of the first (without the spine) is less than one-third of the distance between the two fins. Extremity of the ventral below the end of the second dorsal. *Scales pedunculate, with five or six ribs each.* Blackish brown, spotted with darker.

Coast of Portugal; Madeira. Scarce. A fish of great depths and caught in the same way as the *Espinheis*. Not exceeding 35 inches in length. (*Capello.*)

CENTROPHORUS SQUAMOSUS, GMELIN.

Centrophorus squamosus, GMELIN, 1788, I, 1502.—DUMÉRIL, Elasmobr., 448.—BOCAGE and CAPELLO, P. Z. S., 1864, 260.—Peix. Plagiost., 27, pl. III, fig. 2 (fig. of scales).—CAPELLO, Jorn. Acad. Sc. Lisboa II, 144.—Cat. Peix. Port., 1880, 48.—GÜNTHER, Cat., VIII, 422.

The labial fold extends a little way along the margin of the upper jaw, but not along that of the lower. Teeth $\frac{3\ 2}{5\ 2}$, the upper inclined outward, with a notch on the outer side of the base, but not on the inner; *no median tooth in the lower jaw.* The distance between the nostrils is about one-third of the length of the præoral portion of the snout. Lower angle of the pectoral fin very slightly produced. The length of the base of the second dorsal fin (without the spine) is two-thirds that of the first (without the spine); and the length of the base of the first (without the spine) is about one third of the distance between the two fins. Extremity of the ventral fins below the middle of the second dorsal fin. *The scales are leaf-shaped, with a strong median keel, quite free, inserted in the skin by a short stalk.* Brown. (*Günther.*)

C. squamosus also occurs only off the coast of Portugal.

CENTROPHORUS DUMERILII, (JOHNSON).

Machephilus Dumerilii, JOHNSON, Proc. Zoöl. Soc., 1867, p. 713.

Most closely allied to *C. squamosus*. The labial fold extends a little way along the margin of the upper jaw, but not along that of the lower. Teeth $\frac{1\ 1}{2\ 4}$, the upper small, straight, triangular, with a constricted cusp standing on a broad base; *a median tooth in the lower jaw.* The distance between the nostrils is a little less than one-third of the length of the præoral portion of the snout. Lower angle of the pectoral fin very slightly produced; the length of the base of the second dorsal fin (without the spine) is two-thirds of that of the first (without the spine), and the length of the base of the first (without the spine) is nearly one-half of the distance between the two fins; extremity of the ventral fins below the middle of the second dorsal fin. *The scales are leaf-shaped, with a strong median keel, quite free, inserted in the skin by a short stalk;* brown, with dark spots. (*Günther.*)

The type of the species, a male, from Madeira, 43 inches long, was presented by J. Y. Johnson, Esq., to the British Museum.

CENTROPHORUS CALCEUS, Lowe.

Centrophorus calceus (Lowe), Bocage and Capello, Apuntamentos Ichth. de Portugal, Peixes Plagiost., Lisbon, 1866, 23.
Acanthidium calceus, Lowe, P. Z. S., Lond., 1839, 93.
Centrophorus calceus, Lowe, *loc. cit.* 1843, 93.—Bocage and Capello, Peixes Plagiost., 28, pl. 2, fig. 1.—Capello, Jorn. Acad. Sc. Lisboa, II, 144.—Günther, Cat., VIII, 423.
Centrophorus crepidalbus, Capello, Proc. Zoöl. Soc., 1864, 261, fig. 2.—Cat. Peix. Port., 1880, 48.

The labial fold extends for some distance along the margin of the jaws. Snout spatulate, much produced, the distance between the nostrils being less than one-third of the length of the præoral portion of the snout. Lower angle of the pectoral fin rounded, not produced; the length of the bases of the two dorsal fins (without the spines) is nearly equal, and one-half of the distance between them; extremity of the ventral fins below the middle of the second dorsal fin. *The scales are small, tricuspid*, and so minute as to give a velvety appearance to the skin. (*Günther.*)

This form occurs off the coasts of Portugal and Madeira.

CENTROSCYMNUS, Bocage and Capello.

Centroscymnus, Bocage and Capello, Proc. Zoöl. Soc., 1864, 263; (type, *Centroscymnus cœlolepis*, Bocage and Capello).—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 17.
Centroscymnus (subgenus], Günther, Cat. Fish. Brit. Mus., VIII, 423.

Dorsal fins each with a *spine*, which is *hidden below the skin*. Mouth wide, but little arched; a long, deep, straight, oblique groove on each side of the mouth. Teeth of the lower jaw oblique, with the point more or less directed outwards; upper teeth lanceolate, on a quadrangular base, with a single cusp. Spiracles wide, behind the eye. Gill openings narrow.

CENTROSCYMNUS CŒLOLEPIS, Bocage and Capello. (Figure 13.)

Centroscymnus cœlolepis, Bocage and Capello, Proc. Zoöl. Soc., 1861, 263, fig. 1; Peix. Plagiost., 39, pl. 2, fig. 3.—Capello, Jorn. Acad. Sc. Lisb., II, 144, plate of teeth; Cat. Peix. Port., 1880, 49.—Wright, Ann. and Mag. N. H., 1868, 426.—Goode and Bean, Bull. Essex Inst., 1877, 30.—Vaillant, Exp. Scient. Trav. and Talisman, 63, pl. II, fig. 1.
Centrophorus cœlolepis, Günther, *op. cit.*, VIII, 423.

Labial groove prolonged forwards, but separated by a broad space from that of the other side. Upper teeth very small, narrow and lanceolate. The distance between the nostrils is rather less than one-half the length of the præoral portion of the snout. Lower angle of the pectoral rounded, not produced. Dorsal fins short, especially the first, the length of which (without the spine) is only about one-sixth its distance from the second; extremity of the ventrals below the end of the second dorsal. Scales on the head and nape with striæ; the others smooth, with a depression at the base. Uniform blackish brown. (*Günther.*)

Capello records the species from Setubal, and J. Y. Johnson obtained an example from the sea of Madeira. The species is abundant on the offshore banks of New England, at the depth of 200 fathoms and more. It is ovoviviparous, like *Squalus*.

The naturalists of the French expedition made some very interesting observations upon the breeding habits of this shark, in August, 1881. Most of the females were in condition of gestation. The number of young varied from thirteen to fifteen. These were of various sizes—from 10 to 160 millimeters—and Vaillant, in his report (p. 66), gives interesting details concerning them. It is the idea of Vaillant that these females, at the approach of the breeding season, come nearer to the surface of the water in order to find a greater heat, the temperature at the great depths where they are supposed ordinarily to live not being sufficient to develop the young. He remarks, however, that the specimens taken near Setubal, in deeper water were evidently very near the period of parturition, and that it is evident that the removal to warmer temperature is not always indispensable.

Dr. E. Percival Wright reported to Dr. Günther that he had seen the Portuguese fishermen capturing this form at a depth of 400 or 500 fathoms, with hand lines 2,400 feet in length, and that they came from the same depth with *Hyalonema*.

Centroscymnus obscurus, Vaillant (Voy. Travailleur et Talisman, 67, pl. II, fig. 2), is doubtfully assigned to this genus, having close affinities also with *Centrophorus*. It was taken off Soudan in 200 fathoms and below.

OXYNOTUS, Rafinesque.

Oxynotus, Rafinesque, Indice, 1810, 45.
Centrina, Cuvier, Règne Animal, ed. 1, 1817, II, 130.

Spinacoid sharks, with elevated, trihedral trunk, and with a fold of skin along each abdominal edge, and upon dorsal ridges between the fins; two dorsal fins, each with strong spine; no anal. Mouth narrow, with deep lateral grooves. Lower teeth small, erect, triangular, serrated; upper teeth slender, conical, grouped in front of jaw. Spiracles wide, immediately behind eye. Branchial openings narrow. No nictitating membrane.

Mediterranean and adjacent parts of Atlantic.

OXYNOTUS CENTRINA, (Linn.), Rafinesque. (Figure 21.)

Squalus centrina, Linnæus, Syst. Nat., ed. X, 1758, I, 233 (from Mediterranean, based on descriptions of Rondelet and Salviani).
Oxynotus centrina, Rafinesque, Ind. d' Ittiologia Siciliana, 1810, 45, 60.—Gill, Ann. Lyc. Nat. Hist. N. Y., VII, 405.
Squalus (*Acanthorhinus*) *centrina*, Blainville, Faune Française, 61, pl. XV, fig. 1.
Centrina Salviani, Risso, Hist. Nat. Eur. Mérid., Poiss., III, 135.—Bonaparte, Icon. Faun. Ital., Pesci, CXII, fig. 2.—Müller and Henle, S. B. Plag., 87.—Bocage and Capello, Peixes Plagiost., 32.—Capello, Jorn. Acad. Sci. Lisboa, II, 112, fig. of teeth.—Günther, Cat. Fish. Brit. Mus., VIII, 417.—Canestrini, Pesci d' Italia, 41.—Guichenot, Explor. Sci. d'Algéria, Poissons, 126.—Day, Fish. G. B. & Ireland, II, 318.—Giglioli, Elenco, 1883, 112.
Centrina oxynotus, Swainson, Fishes, II, 365.
Centrina vulpecula, Moreau, Poiss. de la France, I, 355, fig. 61.

The *Centrina*, called in Italy "*pesce porco*," "*puerco*," and "*poure marin*," in Portugal "*peixe-porco*,," in France "*humantin*," is not unusual in the Mediterranean, and individuals have been taken at considerable depths on the Setubal banks, by Portuguese naturalists, while Moreau records a straggler from the mouth of the Loire. In 1877 one was taken in 26 fathoms off the coast of Cornwall, and in past years the species appears to have strayed as far north as Cornwall.

Its claim to a position among the deep sea fishes is doubtful, but in the opinion of some ichthyologists it is an inhabitant of great depths.

It has never been found outside of the northwest Atlantic.

Family SCYLLIORHINIDÆ.

Scylliidæ, Günther, Cat. Fish. Brit. Mus., VIII, 1870, 400.—Gill, Fam. Fishes, 21.—Day, Fishes Gt. Britain & Ireland, II, 309.

A family of sharks distinguished by the position of their dorsal fins and their laying eggs like those of the rays. The body is more elongated than in the sharks generally; the scales developed as fine shagreen; the head depressed and oval; the nostrils with large flaps; the mouth inferior and arched; the teeth small (several series being in use at the same time), compressed, and cuspidate; branchial apertures five, the posterior of which are above the pectorals; spiracles behind the eyes well developed; dorsal fins two, the anterior above or behind the ventrals; anal fin present, variable in position; caudal fin extended toward the end of the tail, and with the lower lobe little produced downward at its front margin; pectorals moderately developed and with rounded angles.

The family, as thus defined, embraces *Scyllium*, *Pristiurus*, *Stegostoma*, *Parascyllium*, *Chiloscyllium*, and related genera. They are inhabitants entirely of the seas of the Old World and Australia, none being found in American waters. They are among the few sharks which lay eggs invested in parchment-like cases, like those of the rays.

KEY TO THE ATLANTIC GENERA OF SCYLLIORHINIDÆ.

(Adapted from Günther.)

I. Nasal and buccal cavities separate.
  A. Caudal fin with upper edges entire.
    1. First dorsal short, elevated; anal origin in advance of second dorsal........... SCYLLIORHINUS
    2. First dorsal long, very low; anal origin behind that of second dorsal........... PSEUDOTRIACIS
  B. Caudal fin with upper edges serrated.. PRISTIURUS
II. Nasal and buccal cavities confluent.
  C. Second dorsal fin nearly opposite anal.. GINGLYMOSTOMA

Other genera, *Stegostoma*, *Parascyllium*, *Chiloscyllium*, and *Crossorhinus* are peculiar to oriental faunas. *Ginglymostoma* is a shallow-water form, inhabiting warm waters. Few species of *Scyllium* have been found at considerable depths.

This family is nearly cosmopolitan, but has no representatives in either the western Atlantic or in the eastern Pacific, except a single *Scyllium* on the coast of Chile.

SCYLLIORHINUS, Blainville.

Scylliorhinus, BLAINVILLE (Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 1883, 869).
Scyllium, CUVIER, Règne Animal, 1829, II, 386.—MÜLLER and HENLE, S. B. Plag., 3.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 400.—DAY, Fish. Gt. Britain and Ireland, II, 309.—GILL, Ann. Lyc. Nat. Hist., III, 407.

Spiracles behind the eyes. Nasal cavities distinct from that of the mouth. Teeth small, in many rows, usually with a central and one or two lateral cusps. Origin of anal fin in advance of that of the second dorsal; upper edge of caudal not serrated. (*Day.*)

SCYLLIORHINUS RETIFER, (GARMAN). (Figures 14, 15.)

Scyllium retiferum, GARMAN, Bull. Mus. Comp. Zoöl., 1881, VIII, No. 11, 233.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., vol. X, No. 5, 226.
Scylliorhinus retifer, JORDAN, Cat. Fish. N. A., 1885, 5.

Body moderate, portion behind the vent longer; head depressed, width nearly equal to its length in front of the spiracles. Distance across the head at anterior angles of eyes, from angle of eye to end of snout, between angles of mouth, between outer angles of nostrils, or between angle of nostril and that of mouth, about equal. Shape of body similar to that of *S. canicula*. Snout moderate, length from mouth less than the distance between the outer margins of the nostrils. Nasal valves separated by an interspace of less than their width, not reaching the mouth, somewhat folded, without a free cirrus. Mouth medium; the height of the irregular arch formed by its outline is little more than half its width. Labial fold on lower jaw extending nearly one-fourth of the distance to the symphysis; fold on upper jaw rudimentary. Teeth small, alike on upper and lower jaws, bearing a sharp central cusp, on each side of which are two smaller ones, several series in function at the same time. No nictitating membrane. Spiracles small. Gill openings small, fourth and fifth over the base of the pectoral. Pectorals moderate, broad, short, anterior margins curved, extremities rounded. Ventrals rather small, united for a short distance behind the claspers, outer extremity broadly rounded, posterior angle acute. First dorsal much larger than the second, about twice the length of its base in advance of the latter, extending forward above the free portions of the ventrals, insertion very near the middle of the total length. Second dorsal smaller than the anal, which extends below the anterior half of its entire length, not reaching the caudal. Caudal not large, a shallow notch between its upper and lower lobes, upper slightly indented on its hinder margin. Scales of shagreen small, unequal; on those of the back there are three or five carinæ, the median of which is prolonged into an acute point.

Light brownish, or reddish brown, crossed at irregular intervals by groups of two to four narrrow black lines which are joined toward the flanks by short lines in such manner as to inclose polygonal spaces, thus forming a network in which the meshes vary exceedingly in size and shape. Uniform light yellowish below.

Total length, 12.25; snout to vent, 5.75 inches.

One specimen was obtained by the *Blake*, lat. 38° 22′ 35″ N., long. 73° 33′ 40″ W.; 89 fathoms. The Fish Commission has since obtained several others.

A young individual, 6 inches in length, was obtained by the *Blake* off Barbados, at Station CVII, at a depth of 200 fathoms, the coloration of which is so unlike that of the typical *S. retifer* that at first sight it would seem to belong to quite a different form, but a study of its coloration reveals a general correspondence with the specimen described by Garman. The reticulations are scarcely visible, and the spaces between the lines at the base of each of the dorsal fins are filled by a shading of uniform brown reënforced by darker blotch-like lines, and a similar transformation is observable—two blotches on the tail and three in advance of the first dorsal, as well as upon the base of the pectorals and in a spot upon each side midway between the extremity of the pectoral and the base of the anal. Approximately in the track of the narrow lines observable in Garman's specimen may be found various spots and blotches of blackish brown, so that at first sight it gives the impression of being covered with blotches rather than with reticulations.

It was at first our intention to describe this as a separate species under the name of *S. boa*, but it is doubtful if it can be regarded even as a color variety, the markings being doubtless due to immaturity.

SCYLLIORHINUS PROFUNDORUM, sp. nov, GOODE and BEAN. (Figure 16.)

Nasal valves confluent, with a short blunt cirrus on the posterior as well as on the anterior flap, being nearly opposite; the length of nasal cavity about equal to the horizontal diameter of the eye, the two cavities separated by a space equal to half that of the interorbital area, and two-fifths the length of the snout; the distance of the posterior angle of the nasal cavity from the root of the teeth at the nearest point equal to half the area between the cavities; distance from the symphysis to the tip of the snout equal to the width between the angles of the mouth. A well developed labial fold at the angle of the mouth, extending on the lower jaw halfway from its angle to the symphysis, and on its upper jaw nearly in the direction of the nasal cavity, disappearing at half the distance. Teeth moderate, with two small lateral cusps on each side of the longer middle cusp, in about five rows. Gill openings narrow, somewhat less than the long diameter of the eye; the distance from the anterior opening to the last, which, like the fourth, is above the angle of the pectoral fin, is equal to half the length of the snout. Ventral fins thick, short, leaf-shaped, their origin twice as far from the nasal cavity as is the last of the gill openings. The origin of the anal fin under the tip of the first dorsal, and its end under the end of the dorsal; its base equal to half the length of the head (without the gill openings), nearly equal to the combined length of the bases of the two dorsals. Caudal continued in the line of the axis of the body; lower lobe rounded, and in its greatest height not deeper than the height of the caudal extension of the body at the same point. Color, uniform grayish brown.

A single individual (No. 35646, U. S. Nat. Mus.), 20½ inches in length, was obtained by the Fish Commission steamer *Albatross* at a depth of 816 fathoms, in lat. 39° 9′ N., long. 72° 3′ 15″ W.

PSEUDOTRIACIS, Capello.

Pseudotriakis, CAPELLO, Jorn. Sc. Math., Phys. e Nat. Lisboa, IV, 1867.
Pseudotriacis, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 395.

Body elongate; mouth wide, with a very short labial fold around the angle; snout depressed, rounded, moderately long; nostrils inferior, near the mouth, but not confluent with it; eyes oblong, lateral, without nictitating membrane; spiracles well developed behind the eye; gill openings moderate, in advance of the pectoral; jaws armed with numerous rows of small, tricuspid teeth; first dorsal fin opposite the space between pectorals and ventrals, long and low, gradually increasing in height posteriorly; second dorsal behind ventrals, opposite and similar to anal; ventrals and pectorals well developed; no pit at the root of caudal fin, the basal lobe of which is very low and long; skin with minute asperities.

PSEUDOTRIACIS MICRODON, CAPELLO. (Figure 18.)

Pseudotriacis microdon, CAPELLO, Jorn. Sc. Math. Phys. e Nat. Lisb., IV, pl. 5, fig. i; Jorn. Acad. Sc. Lisboa, I, 315, 321, pl. V; *loc. cit.*, II, 139; Cat. Peix. Port., 1880, 44.—GÜNTHER, Cat., VIII, 395.—BEAN, Proc. U. S. Nat. Mus., 1883, 147.

The following description and table of measurements are from Dr. Bean's account of the species:

The greatest height of the body is at the origin of the first dorsal; it is contained eight and three-sevenths times in the total length. The height at the origin of ventrals is contained nine and one-half times in total length. The height of head at the first gill opening is a little greater than that of body at the ventral origin, while the height of the head at the angle of the mouth is a little less than one-eleventh of the total length. The least height of the tail equals the height of the anal, and is contained twenty-five times in total length.

The head is somewhat depressed in front, with moderately sharp snout, which is nearly twice as long as the distance of its tip from the mouth. The distance from snout to last gill opening is contained five times in total length. The distance from snout to first gill opening, measured horizontally, equals twice the height of body at origin of second dorsal. The distance between the first and last gill openings equals nearly twice the length of the eye. The height of the first gill opening is about equal to the distance between the angle of the mouth and the spiracle. The height of the head at angle of mouth is contained eleven times and at the first gill opening nine times in total length. The length of the snout equals one-half the body height at origin of first dorsal. The distance of mouth from snout, measured on the axis of the fish, equals one-third width of mouth. The distance from snout to angle of mouth, obliquely taken, equals one-fourth the distance from snout to last gill opening. The distance between eye and spiracle equals that from mouth to nostril. The distance from angle of mouth to spiracle is about equal to height of first gill opening. The spiracle is moderately large, the length of its opening being contained twice in the height of fourth gill opening. The oblong eye is placed near the dorsal profile; the length of the orbit is about one-half the greatest height of second dorsal; the length of the eye equals about one-fourth width of mouth. The length of upper jaw is slightly more than that of lower, and nearly equals the distance between the spiracles. The distance from the mouth to the nostril is about one-fourth least height of tail; the distance between nostrils equals four times the distance from eye to spiracle. The interorbital space equals one-half the length of second dorsal base. The distance between the spiracles equals four times their greatest length.

The first dorsal is very long and low, highest behind its middle, the length of its base equal to seven times its greatest height; its distance from the snout is a little more than twice the greatest length of pectoral. The second dorsal is distant from the end of the first a length equal to nearly twice its greatest height; the length of its base is somewhat more than the body height at origin of first dorsal.

The second dorsal begins at a distance from the end of the first, equal to the height of body at ventral origin; the length of its base equals twice the interorbital distance; its height equals nearly twice the length of the orbit.

The anal is entirely under the second dorsal, but its base is a little less than five-sevenths as long as that of the latter; the greatest height of the anal equals the least height of caudal peduncle.

The caudal originates at a distance from the end of the second dorsal about equal to the height of the anal; it is divided by a notch into a short upper portion, whose length is very little more than the greatest height of first dorsal, and a very low and long lower portion, the longest margin of which is nearly twice as long as the snout. The distance of the caudal from the end of anal base equals one-fourth the length of second dorsal base.

The distance of pectoral from snout is contained five times in total length; the length of pectoral equals nearly twice the width of its base, and is a little more than one-ninth of total length. The greatest width of pectoral equals twice the height of anal, and is contained twelve and one-third times in total length.

The origin of the ventral is slightly in advance of the end of first dorsal, and is behind the middle of total length a distance equal to the interorbital space. The length of ventral equals that of lower jaw. The width of ventral base equals that of pectoral base; the greatest width of ventral slightly exceeds its length.

Color.—When received the margins of the fins were apparently faded; the original color was probably grayish brown with dark margins on all the fins except the first dorsal. Capello states that his example was chestnut-brown.

The National Museum received February 12, 1883, in the fresh state, a fine example of a species of *Pseudotriacis*, which came ashore at the Amagansett Life-Saving Station on Long Island, February 8, 1883, forwarded by Mr. J. B. Edwards, keeper of the Suffolk Life-Saving station. [The specimen is the one here described.]

No species of the genus *Pseudotriacis* has heretofore been recorded in the western Atlantic.

The gills and mouth were obstructed by sand. The only parasites discovered on the animal were a couple of isopods, one of which was found in the eye cavity.

MEASUREMENTS.

	Millimeters.	Hundredths of length.
Total length	2,950	100.0
Body:		
Height at origin of first dorsal	350	12.0
Height at origin of ventral	310	10.5
Height at origin of second dorsal	210	7.0
Height at end of ventral base	210	7.0
Least height of caudal peduncle	118	4.0
Width at origin of first dorsal	250	8.5
Head:		
Distance from the tip of snout to first gill opening:		
Horizontally	425	14.4
Obliquely	450	15.3
Distance from tip of snout to last gill opening	583	20.0
Distance from first gill opening to fifth	133	4.5
Distance from first gill opening to fourth	102	
Distance from first gill opening to third	62	
Distance from first gill opening to second	27	
Height of first gill opening	75	
Height of second gill opening	73	
Height of third gill opening	72	
Height of fourth gill opening	70	
Height of fifth gill opening	68	
Height at angle of mouth	265	9.0
Height at first gill opening	325	11.0
Height at base of pectoral	342	11.6
Distance from tip of snout to eye (horizontally)	176	6.0
Distance from tip of snout to mouth (horizontally)	90	3.0
Head—Continued.		
Distance from tip of snout to mouth (obliquely)	147	5.0
Distance from tip of snout to angle of mouth (horizontally)	280	9.5
Distance from tip of snout to angle of mouth (obliquely)	305	10.3
Distance from tip of snout to spiracle (horizontally)	286	9.7
Greatest length of spiracle	56	2.0
Length of opening of spiracle	35	
Distance from eye to spiracle	31	
Distance from angle of mouth to spiracle	74	
Length of orbit	80	2.7
Length of eye	68	2.3
Width of mouth	270	9.0
Length of upper jaw to angle of mouth	219	7.4
Length of lower jaw to angle of mouth	215	7.3
Distance from mouth to nostril	30	
Distance between nostrils	125	4.2
Distance between eyes	182	6.2
Distance between eyes on cartilage	142	4.8
Distance between spiracles	226	7.7
First dorsal.		
Distance from snout	1,000	34.0
Length of base	670	22.7
Greatest height	95	
Second dorsal.		
Distance from end of first dorsal	310	10.5
Distance from snout	1,980	67.0
Length of base	368	12.5

MEASUREMENTS—continued.

	Millimeters.	Hundredths of length.
Second dorsal—Continued.		
Greatest height	158	5.4
Length of posterior margin	55	....
Anal		
Distance from snout	2,087	70.7
Length of base	250	8.5
Greatest height	119	4.0
Length of anterior margin	233	....
Length of posterior margin	47	....
Caudal:		
Distance from end of second dorsal	116	......
Distance of tip from end of second dorsal	620	21.0
Greatest width	232	....
Length of upper lobe	98	......
Greatest width of upper lobe	117	....
Caudal—Continued.		
Distance of lower lobe from anal base	91	....
Length of anterior margin of lower lobe	228	....
Length of longest margin of lower lobe	345	....
Pectoral:		
Distance from snout	590	20.0
Greatest length	330	11.2
Width of base	169	5.7
Greatest width	240	8.0
Ventral·		
Distance from snout	1,655	56.0
Greatest length	215	7 3
Length of posterior margin (last ray)	108	....
Width of base	170	5.7
Greatest width	222	7.5

PRISTIURUS, Bonaparte,

Pristiurus, BONAPARTE, Fauna Italica, Pesce, 1832, 42.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1875, 406.—CANESTRINI, Pesc. Italici, 50.

Scyllioid sharks with two spineless dorsal fins, the first above or behind ventrals, the second above hinder end of anal; one or two were of small, flat spines arranged saw-like on each side of the upper edge of the caudal. Snout elongated, covered with a thick layer of cellular tissue, within which a gelatinous substance is secreted, escaping by numerous pores of the skin. Spiracles present. Nostrils wide, inferior, covered by a valve. Teeth small, tricuspid. Represented by a single species.

PRISTIURUS MELASTOMUS,(RAFINESQUE), BONAPARTE. (Figure 10.)

Galeus melastomus, RAFINESQUE, Caratt. Anim. Piant. Sicil., 1810, 13.
Scyllorhinus melastomus, BLAINVILLE, Faun. Franc., 74.
Scyllium melastomum, JENYNS, Manual, 497.
Pristiurus melanostomus, BONAPARTE, Fauna Italica, Pesce, pl. XLIX, fig. 3.—DUMÉRIL, Elasmobr., 325.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 406, Challenger Report, 2.—COLLETT, Norges Fiske, 407; Nyt. Mag. f. Naturvid., XXIII, 1881, 117.—CANESTRINI, Pesci Italici, 51.—GIGLIOLI, Elenco, 112.
Squalus annulatus, NILSSON, Prodromus Ichthyologica Scandinaviæ, 113.
Scyllium annulatum, NILSSON, Skand. Fauna, 713.
Scyllium Artedi, RISSO, Hist. Nat. Europe Méridionale, III, 1827, 117.
Pristiurus Artedi, BOCAGE and CAPELLO, Peixes Plagiostomos, 1866, 11.—CAPELLO, Jorn. Acad. Sci. Lisboa, II, 139; Catalogo dos Peixes de Portugal, 1880, 44.
Scyllium acanthonotum, DEFIL. and VER. (young specimen, *fide* Giglioli).

A *Pristiurus* with the nasal valves separated by a broad interval and placed nearer to the mouth than to the end of the snout; a short labial fold round the angle of the mouth. Dorsal fins subequal in size, the second above the hinder part of the anal; anal fin nearly as long as the head to the first gill opening; upper parts with rounded darker spots of various sizes, each with a lighter margin. (*Günther*).

Pristiurus claims a place among deep-sea fishes on account of its captures near Tromsöe, at a depth of 250 fathoms. The species is abundant on the coast of Norway, as far north as Trondhjems Fiord (lat. 63° 30′), where, according to Storm, it is found in considerable depths (lat. 70°). It is rare on Christiania Fiord (lat. 58°). Farther south it is a littoral form, occurring at Madeira and also in the vicinity of Lisbon, where it is rare and is called *Leitão* or *Litão*. It is the "Eyed Dogfish" of Couch and Yarrell, who have recorded a single specimen (25 inches long) from the coast of Cornwall, taken by a line fisherman off Polperro, in 1837.

In the Mediterranean it is found at considerable depths. In July, 1879, Prof. Giglioli, fishing off Genoa with trawl lines, took 50 individuals at depths of 400 to 500 fathoms.

PRISTIURUS ATLANTICUS, VAILLANT. (Figure 20.)

Pristiurus atlanticus, VAILLANT, Exp. Scient. Trav. et Tal., 1888, 59, pl. I, fig. 1.

A *Pristiurus* closely resembling *P. melastomus*, Rafinesque, but with its snout somewhat more obtuse, its length from the extremity of the upper lip being less than the distance between the labial commissures, while in the other species it is equal or greater. The teeth are somewhat stouter, less elongate, and on their sides are two denticulations instead of the single one. They also appear to be more numerous—31 on each side of the upper jaw, in place of 28 in *P. melanostomus*. The cutaneous plates, although similar in character and very like in form, have the margin proportionately narrower, and the middle rib more narrow and salient, the lateral teeth being less divergent. The branchial openings decrease in width posteriorly, the last not more than half the height of the first; while in *P. melanostomus* it is at least three-fourths.

The above description is a translation of the description by Vaillant, who, though admitting that the differences taken singly are slight, considered that taken together they impart to the animal a peculiar physiognomy, and that the comparison of a number of specimens of the same size seemed to him to justify the establishment of a new species.

Vaillant is of the opinion that possibly this form may be that described by Lowe from Madeira, under the name *Pristiurus melanostomus*.

A single female, 440 millimeters in length, was taken at a depth of 540 meters off Cape Spartel, from Station VIII of the French expedition.

Family CETORHINIDÆ.

Cetorhinidæ, GILL, Arr. Fam. Fish., 1872, 24.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 30.

Selachians with very wide gill openings in advance of pectorals, extending from the back nearly to the middle line of the throat. Mouth moderate, the teeth small, numerous, conical. Nictitating membrane lacking. A small spiracle between eye and first gill opening. First dorsal large, above space between pectorals and ventrals; second dorsal and anal small. Pectorals and ventrals large. Caudal fin lunate, a pit at its root, the upper lobe considerably the larger. Sides of tail keeled.

CETORHINUS, Blainville.

Cetorhinus, BLAINVILLE, Bull. Soc. Philom., 1816, 121.
Selache, CUVIER, Regne Animal, 1829, 390.
Polyprosopus, COUCH, Brit. Fish., I, 67-68, pl. XV.

Eye destitute of membrana nictitans; a small spiracle between the eye and the first gill opening. Gill openings very large. Gills furnished with gill rakers for filtering purposes, and consisting of an elastic apparatus of dentine. Teeth small, conical, without dilated bases, and their sides smooth. First dorsal fin above the interspace between the pectoral and ventral; second dorsal and anal small. Caudal with a lower lobe and a pit at its root; sides of the tail keeled. (*Day.*)

CETORHINUS MAXIMUS, GUNNER. (Figure 17.)

Squalus maximus, GUNNER, Trondhj. Selsk. Skrift., 1765, III, 33, pl. II, IV, 14, pl. III.—LINNÆUS, Syst. Nat., ed. XII, 1766, 400.

Selache maxima, CUVIER, Regne Animal, 1829, 391.—MÜLLER and HENLE, S. B. Plagiost., 71.—DUMÉRIL, Elasm., 143.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 394.—BOCAGE and CAPELLO, Peix. Plagiost., 11.

Cetorhinus maximus, GOODE and BEAN, Bull. Essex Inst., XI, 29.—GIGLIOLI, Elenco, 1883, 112.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 31.—DAY, Fish. G. B. & Ireland, II, 303, pl. CLVIII, fig. 1.

Squalus elephas, LE SUEUR, Journ. Acad. Nat. Sci. Phila., II, 343, fig.—DE KAY, Zoöl. N. Y., Fish., 357, pl. LXIII, fig. 208.

belonging to each side of the body) which have coalesced. Though small and harsh to the touch, the scales on the body are not sharp; they offer about the same resistance from whatever direction the finger may be passed over them. On the tail, however, they are very sharp and the points are directed backward. Along the edges of the canals on both body and tail the scales are compressed and flattened; they form the only cover or protection for these organs, which in the specimen described have the appearance of long seams or grooves. On the skull these canals do not stand open as on the rest of the body. Near the mouth, and especially toward its angle, the scales are larger and more prominent. Under the middle of the belly, the skin forms two closely approximated rolls or ridges separated by a groove, and inside of these the muscle is thicker than towards the flanks. Intestine very small, valve spiral. Abdominal pores opening behind the vent, protected by a fold. Cartilages soft and flexible as those of Somniosus or Selache. Uniform brown, darker at the thin margins of the fins.

This species was first described in 1884 from a specimen in the Museum of Comparative Zoölogy, believed to have come from Japan. At this time it was suggested that it might correspond very closely to an animal 24 feet in length, observed in 1880 at Pemaquid, Me. (Bull. U. S. Fish Com., III, p. 407, cut), and that it was one of the forms which had been discussed under the name of sea serpent. Günther has since had three specimens, the largest 4 feet 10 inches long, from Yeddo Bay. The Prince of Monaco found it near Madeira, March, 1889.

Order RAIÆ.

Selachians with pectoral fins much developed, and produced from the anterior margins forward, and connected with the rostral cartilages, thereby constituting an integral part of the form, and not abruptly differentiated from the body, as in the sharks and all true fishes; the branchial openings are in two converging rows of five each on the inferior surface of the body; spiracles are well developed behind the eyes. In other respects the order essentially agrees with the Squali, and the two form a common superorder or subclass, the Plagiostomi. The form varies considerably in the several members of the order; on the one hand, the sawfishes have an outline much like that of the sharks, and with a long caudal portion, and, on the other hand, the eagle rays and certain stingrays have a disk extremely wide—much wider than long—and the caudal portion is reduced to a whip-like appendage. These two forms exemplify the extremes of the characteristics according to which the order is divided into two suborders, viz: (1) PACHYURA (including the *Raiidæ*, *Rhinobatidæ*, *Pristidæ*, and *Torpedinidæ*) and (2) MASTICURA, including the "eagle rays" (*Myliobatidæ*), "devil-fishes" (*Cephalopteridæ*), and "stingrays" (*Trygonidæ*).—*Gill.*

Of the several families which compose this order, only one, the *Raiidæ*, is represented in the depths of the sea.

Family RAIIDÆ.

Rajidæ, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 455.

Disk broad, rhomboid, rough or spinous; tail stout, rather long, with a longitudinal lateral fold, usually with two dorsal fins and on some species a caudal fin; pectorals extending to snout; ventrals large; no serrated spine on the tail; oviparous; egg cases leathery, with hollow tendrils at each of the four angles.

RAIA, Linnæus.

Raia, LINNÆUS, Syst. Nat., 1758, 231, ed. x; type *Raia clavata*, L.

Raiidæ, with pectoral fins not continuous around the snout, with ventrals deeply notched, and caudal slightly developed or wanting; with tail quite distinct from the disk, and provided with two-rayed dorsals; skin more or less spinous; dentition differing in the two sexes; the male usually provided with a differentiated patch of spines on each pectoral.

The genus *Raia* is almost cosmopolitan, but most abundant in northern seas.

In this genus are included the forms usually known by the name of Skate. About forty species have been provisionally described, of which perhaps twelve are found in the Atlantic basin below the 100-fathom line. The genus has not yet been collected at a depth greater than 612 fathoms. Of the seven species of *Raia* occurring on the British coast, four at least have been found in deep water. Of the nine species of the Atlantic coast of North America, five have been found in the depths.

The Rays are believed to have been abundant in the Cretaceous and Tertiary periods, but the species most characteristic of early geological times is allied rather to the forms now living in shallow water than to those of greater depths.

The Rays of the eastern and western Atlantic have not been compared with a sufficiently large number of individuals at hand, and it is probable that when this shall be done the number of species for the north Atlantic will be considerably reduced.

The curious egg cases of the Rays, rectangular, black, leathery, with tubular flexible tendrils at each of the four angles, popularly known as "devil's knitting sheaths" or "mermaid's purses," are well known to every stroller along the seashore. The large egg cases of *Raia lævis* are especially familiar.

An unfamiliar form of egg, large, square, and with short tendrils, was found at various depths off Newport in 1880, and young skates with extremely long tails were taken from them. These have not yet been satisfactorily identified, but it will possibly be found that they belong to *Raia radiata*.

RAIA RADIATA, DONOVAN. (Figure 27.)

Raja radiata, DONOVAN, Hist. Brit. Fish., V, pl. 111, 1820.—STORER, Rept Fish. Mass., 201, 1839.—MÜLLER and HENLE, Plagiostomen, 137, 1841.—DUMÉRIL, Elasmobranch., Tom I, Pt. II, 531, 1870.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 460, 1870.—Challenger Report, XXII, 8.—GARMAN, Proc. Bost. Soc. Nat. Hist., XVII, 1874, 178.—GOODE and BEAN, Bull. Essex Inst., XI, 28.—JORDAN, Bull. XVI, U. S. Nat. Mus., 41.

Raja americana, DE KAY, Zoöl. N. Y., Fishes, 368, pl. 66, fig. 215, 1842.—STORER, Syn. Fish. North Amer., 260, 1846.

Raja lævis, STORER, Hist. Fish. Mass., 266 (description), 1867.

Raia with large spinous plates or bucklers, in addition to the spines on pe back, and tail found in *R. ocellata*. These are large, strong spines, with broad stellate or shield-like bases. They are arranged as follows: One or two in front of each eye; one on each side between the eye and the spiracle; a pair on the shoulder, the smaller in front; and fourteen or more forming a dorsal row, beginning just back of the head and extending to the caudal. An irregular row of spines on each side of the tail, separated from the membrane by a band of shagreen; males with two or more rows of claw like spines on the pectorals. Teeth with a long, sharp point, rising from the middle and hooking backwards in the male, bluntish in the female; females larger than the males and more spinous. (*Garman.*)

Raia radiata, which is not very uncommon at moderate depths off the New England coast, but has not yet been found below the 100-fathom line in the western Atlantic, has been recorded by Collett from the region between Spitzbergen and Bear Island at a depth of 127 to 259 fathoms, and also by Strom and Collett, in Throndhjem Fjord in 250 fathoms.

RAIA ACKLEYI, GARMAN. (Figure 23.)

Raja Ackleyi, GARMAN, Bull. Mus. Comp. Zoöl., VIII, 1881, 235.

"Disk, including the ventrals, rhombic, longer than wide; anterior margins sinuous; posterior outline convex; tail moderate, depressed, with a narrow cutaneous fold on each side, tapering. The angle formed by the snout is less than right. Rostral cartilage rather slender. Mouth moderate, much curved; width one and two-thirds times in distance from end of snout. Teeth small, cusps sharp, in forty-two rows on the upper jaw (male adult). Eyes moderately large, interorbital space narrow, deeply concave; width three times in the distance from the end of the snout to the eye. Spiracles smaller than the eye. Ventrals medium; portion in front of the notch rather small. Dorsals small, separated by a space with tubercles. A vertebral series of small tubercles on back and tail; two lateral series on each side of the tail; a series on each orbital ridge; a group of several above the end of the rostral cartilage; a group on each pectoral opposite eye and spiracle; a group of retractile spines opposite the shoulder near the outer angle of the pectoral. Excepting the above, in this specimen, the disk is smooth on the upper surface. The ventral surface is smooth, with the exception of the portion anterior to the mouth, which is covered with fine sharp scales or shagreen.

"Differing from *R. eglanteria* (Lac.), which it resembles in shape, in a somewhat shorter snout and in coloration.

"Disk, including ventrals, 9.5; width, 9; tail, from vent, 9.6; and total length, 16.25 inches.

"Light yellowish brown, sprinkled with small spots of brown intermixed with others of white. On the base of each pectoral, a little behind the shoulder girdle, there is a transversely oblong spot of brown, half an inch in diameter, surrounded by a ring of small spots forming a sort of rosette. Uniform white beneath."

A specimen (No. 748, Mus. Comp. Zoöl.), of this form was obtained by the *Blake*, on the Yucatan Banks, in the Gulf of Mexico. The depth at which it was captured is not recorded, but *R. ornata*, regarded by Garman as a variety of *R. ackleyi*, was taken at 138 to 142 fathoms.

RAIA ORNATA, GARMAN.

Raja ornata, var. nov. *R. ackleyi*, GARMAN, *loc. cit.*, 235 (1881)
Raja ackleyi ornata, JORDAN, Cat. Fish. N. A., 1885, 11.
Raja ornata, GOODE & BEAN, Bull. Mus. Comp. Zoöl., x, 15.

"Disk, including the ventrals, little broader than long, anterior margins convex at the extremities of the pectorals; tail depressed, becoming quite slender backward, with a narrow cutaneous fold on each side. Rostral angle obtuse. Snout not produced beyond the convex margins on each side of it. Rostral cartilage slender, acute. Mouth medium, moderately curved; width one and one-third times in the distance from the end of the snout. Teeth small, smooth, in forty-four series in the upper jaw (young male). Eyes large, interorbital space more than three times their distance from the end of snout. Spiracles smaller than the eye. Ventrals medium; posterior portion elongate, anterior small. Dorsals small, separate. Hinder margin of pectorals rounded. A vertebral series of spines on back and tail; one lateral series on each side of this on the back, and two on the tail; a series on each orbital ridge; a single spine on the forehead between the eyes; a group of several above the end of the rostral cartilage; a spine on each shoulder; a group near each ventral on the hinder angle of the pectoral, and a group on the anterior extremities of the latter. Entire upper surface rough with small, sharp asperities; smooth below.

"Disk to end of ventrals, 4.5; width, 4; tail from vent, 4.6; and total length, 8 inches.

"Light brownish, freckled with lighter, marked with scattered rosettes or groups of small spots of darker. One of these groups stands on the pectoral a little back of the shoulder, a couple near the hinder angle, and one opposite, or a little behind the spiracle. White beneath. Several spots on the tail; one at the base of each dorsal.

"Type No. 915, Mus. Comp. Zoöl.

"One specimen off Alligator Key, Florida; 138 fathoms.

"Three specimens, lat. 32° 24′ N., lon. 78° 44′ W.; 142 fathoms.

"Of the latter, one has only the vertebral series of spines well developed; another has the vertebral and one lateral on each side; and the third has the three series and the scattered spines in the second lateral. One has a third dorsal considerably in advance of the usual pair, near the middle of the length of the tail. Tail extending behind the dorsals in a slender point. At present it seems likely that these young skates represent a variety of *R. ackleyi*. Whether they are more distinct can only be determined by comparison of young and adults of each." (*Garman.*)

An individual obtained by the *Albatross* at station 2377, February 11, 1885, believed to be of this species, was colored as follows: Puncticulate with brown on the dorsal surface, and with a few scattered larger blotches of the same. The ground color is a grayish brown, quite pale.

RAIA PLUTONIA, GARMAN. (Figure 26.)

Raja plutonia, GARMAN, Bull. Mus Comp. Zoöl., Vol. VIII, No. 11, 1881, 236.—GOODE and BEAN, *op. cit.*—GÜNTHER, Challenger Report, XXII, 10.

"Disk, including ventrals, broader than long, subquadrangular, broadly rounded in front and on the lateral angles; snout forming a very blunt angle; margin opposite the gill openings nearly straight. Tail about one and one half times the length of the disk, slender, depressed, with a cutaneous fold on each side near the extremity. Rostral cartilage short, not extending to the end of the snout. Mouth moderate, slightly curved, width equaling the distance between the outer angles of the nostrils, and contained twice in its distance from the end of the snout. Teeth about thirty-two series (a young specimen). Eyes large, longitudinal diameter of orbit greater than their distance apart. Interorbital space concave, narrow; width rather more than two and one half times in the distance of the eyes from the end of the snout. Spiracles small. Anterior nasal valve tubular; posterior reaching the mouth, free on its outer margin. Hinder extremity of pectoral broad, rounded. Ventrals deeply notched, anterior portion narrow, extending farther from the middle of the pelvis than the posterior. * * *

"Back and tail covered with small, closely set, stellate based scales, which bear elongate, slender, compressed, backward-directed points. Larger spines form a superorbital row, and a single one stands on each side of the back of the head. The largest on the body form a close vertebral series on back and tail. On each side of the shoulder girdle there is an irregular series of five, and a short distance in front of each of these stands one or a pair. On each side of the tail there are two series, little smaller than those of the medial row. Smooth below. Very small specimens have not so many spines.

"Brown, grayish in small to purplish in the largest specimens at hand, with more or less irregular transverse series of distinctly defined spots of brown, often confluent into short bands, interspersed among which are spots of white of varying size and shapes. Tail with cross bands of light and of dark. Dorsals dark. Entire lower surface white." (*Garman.*)

This species was obtained during the cruise of the United States steamer *Blake*, in from 229 to 333 fathoms, off the coast of Florida, in lat. 32° N., lon. 78° (stations 316, 317, 321).

In the specimens described by Garman the rostral cartilage was undeveloped, and he proposed tentatively the subgenus *Malacorhinus* for their reception.

Specimens were obtained from the following stations: CCCXVII, lat. 31° 57′, lon. 78° 18′ 35″, 333 fathoms, 1; CCCXVI, lat. 32° 7′, lon. 78° 37′ 30″, 229 fathoms, 5; CCCXXI, lat. 32° 43′ 25″, lon. 77° 20′ 30″, 233 fathoms, 1.

RAIA CIRCULARIS, COUCH. (Figure 25.)

Raja circularis, COUCH, Charlesworth's Mag. Nat. Hist., 1838, II, 71; Cornish Faun., p. 53; Fish. Brit. Isl., i, 115, pl. 28.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 462; Challenger Report, XXII, 8.—DAY, Fish. G. B. and Ireland, II, 348, pl. CLXXIV.

"Angles formed by the margin of the snout obtuse, the extremity slightly projecting. The width of the interorbital space equal to the length of the orbit. Teeth pointed, in from 70 to 80 series in the upper jaw. Outer pectoral angle obtusely rounded. Upper part of the body covered with minute asperities; a series of spines all along the superciliary ridge; *a triangular space in the middle of the back covered with similar spines; median line of the* *back and tail without spines, or with a few only; several series of spines on each side of the median line of the body and tail.* Generally a round black spot, marbled with yellowish, on each side of the body. Old examples without this ocellated spot, or with a few scattered small white round spots.

"Adult male with the additional patches of spines usual in this genus." (*Günther.*)

This species, the "Sandy Ray" of British writers, is closely allied to ***Raia erinacea***, Mitchill (=*Raia eglanteria*, as defined by Günther), the most abundant of all skates on the coast of New England, which has, however, not yet been found below the 100 fathom line.

Günther speaks as follows of the abyssal range of *R. circularis*:

"One specimen, a female, 15 inches long, was obtained on the cruise of the *Triton*, in the Faröe Channel, at a depth of 516 fathoms (station 10, August 24, 1882). Also, Collett reports its occurrence in 130 and 370 fathoms off the coast of Norway. The Faröe specimen does not differ in its armature from specimens obtained on the south coast of England, only the spines on the upper side of the snout and the interorbital space are somewhat more developed, though in this respect litoral specimens show likewise some variation. With regard to color, it is notable that the spot on each side of the back which, in littoral specimens, is variegated with yellow, is much smaller in the deep-sea specimen, and uniformly black, without yellow. The lower parts are nearly uniform blackish brown, which color laps over to the upper side of the ventral fins. Tail with irregular brownish cross bands."

RAIA HYPERBOREA, COLLETT. (Figure 28.)

Raja hyperborea, COLLETT, Forh. Vidensk. Selskab., Christiania, 1878, No. 14, 7 [115 kilometers West of Norsk Öds, Spitzbergen., 459 fathoms, ♂, 518^{mm} long].—COLLETT, Fiske, Norsk. Nordhavs-Expedition, Christiania, 1880, 9, pl., I, figs. 1, 2.—GÜNTHER, Challenger Report, XXII, 8, pl. IV.

The margins of the snout form a right or nearly right angle, its extremity being rounded; the margin of the body between the snout and the extremity of the pectoral fin is undulated. Width of the interorbital space considerably exceeding that of the orbit and spiracle; eye rather small, about as long as the spiracle. Distance between the nostrils a little more than their distance from the end of the snout. Teeth very slender, acutely pointed, widely set, with narrow base. Outer pectoral angle nearly a right one.

Sides of the trunk nearly smooth, but the greater part of the pectorals and the margin of the head, also the snout and interorbital space, are studded with minute or very small spines resting upon a stellate base. A series of larger spines runs along the median line of the back and tail, commencing immediately behind the occiput. A group of three similar spines occupies each side of the shoulder; a short series composed of three or four spines along the supraorbital margin and above the spiracle. The spines along the ridges of the snout are also somewhat enlarged. Grayish brown above with a trace of a darker spot on each side of the body. Lower parts white with large subsymmetrical brown patches. In very young specimens the lower parts are uniform white.

"The only example hitherto met with is the male specimen now described, taken in lat. about 80° N. and lon. 6° E., at sea, west of the northern coast of Spitzbergen, the most northerly locality, too, in which this genus is yet known to occur." (*Collett, op. cit.*, 1880.)

A large male specimen, 24½ inches long, was obtained on the cruise of the ***Knight Errant***, at station 9, on August 23, 1880, in 608 fathoms, together with three small ones, of which two are males 6½ inches long, and one a female 8 inches long. A fourth very young specimen was caught at station 4 in about 400 fathoms.

Dr. Günther's remarks on the peculiar characters of this species (Challenger Report, *loc. cit.*) should be carefully considered.

RAIA LÆVIS, MITCHILL. (Figure 29.)

Raja lævis, MITCHILL, Amer. Month. Mag., II, 1817, 327.—DE KAY, Zoöl. N. Y., Fishes, 1842, 370.—STORER, Syn. Fish. N. Amer., 1846, 259.—GARMAN, Proc. Bost. Soc. Nat. Hist., XVII, 1874, 179.

Raja batis, STORER, Rept. Fish. Mass., 1839, 193.

Raja ocellata, STORER, Syn. Fish. N. Amer., 1846, 259.

Raja lævis, STORER, Hist. Fish. Mass., 1867, 266, pl. XXXIX, fig 2.

Angles of the disk more acute than in the other North American *Raias;* muzzle much produced. Spines of the body few and small, some present above the eyes and spiracles, on the snout, along the anterior border of the pectorals, and on the back (very small). Median dorsal row of larger hooked spines extending along the posterior portion of the back and the tail. Usually two lateral rows on the tail. Female rougher. Color variable, brownish, with paler spots, usually ringed with darker.

Specimens of a large skate, apparently of this species, have been taken below the 100-fathom line by the *Fish Hawk* and *Albatross*, and also by the fishermen.

RAIA GRANULATA, Gill. (Figure 30.)

Raia granulata, Gill MS.—Goode and Bean, Bull. Essex Institute, XI, 1879, 28.—Jordan, Cat. Fish. N. A., 1885, 11.—Günther, Challenger Report, XXII, 10.

"A remarkable species with back and ventral surface covered with minute sharp granular ossifications, obtained by Capt. Joseph W. Collins on Le Have Bank. A species of the same type as *R. lævis*, and having 30–31 teeth on each side; the back granulated and slate colored; the ventrals distinguished by reticulate markings, and the claspers slender and scarcely expanded."

This form is closely allied to if not identical with *R. lævis.*

RAIA BATIS, Linnæus.

Raja batis, Linnæus, Syst. Nat., x, 1, 1758, 231.—Günther, Cat. Fish. Brit. Mus., VIII, 1875, 463.—Strom, Norsk. Vidensk. Selsk. Skrift., 1881, 80; 1884, 46.—Collett, Nyt Mag. f. Naturvid., XVIII, 1884, 119.

The "common skate" of Europe, which is generally found near the coast in rather shallow water, has been observed on the Norwegian coast to descend to 150 fathoms. It is very similar to the North American *Raia lævis.*

RAIA FULLONICA, Linnæus.

Raja fullonica, Linnæus, Syst. Nat., ed. x, 1758, 231.—Günther, Cat. Fish. Brit. Mus., VIII, 467.—Collett, Forhandl. Vidensk. Selsk. Christ., 1880, 106; Nyt Mag. f. Naturvid., XVIII, 1884, 119 Vaillant, Travailleur et Talisman, Poissons, 1888, 79, pl. IV, figs. 1, 1a.—Giglioli, Elenco, 1883, 111

This form, the "Shagreen Ray" of English writers, is reported by Collett to occur locally on the Norwegian coast at depths of from 80 to 250 fathoms, and also taken by the *Travailleur*, in 1882, at 614 meters, off the entrance to the Mediterranean. It occurs also in the Mediterranean, especially off Sicily.

RAIA VOMER, Fries.

Raja vomer, Collett, Forhandl. Vidensk. Selsk. Christ., 1880, 106; Nyt Mag. f. Naturvid., 1884, XVIII, 119.—Strom, *loc. cit.*, 1881, 81; 1884, 46.—Günther, Challenger Report, XXII, 11.

Raia vomer is found on the Norwegian coast at greater depths than the common skate, not rare at a depth of 70 fathoms, and descending to, or even beyond, 150 fathoms.

RAIA NIDROSIENSIS, Collett.

Raja nidrosiensis, Collett, Forhandl. Vidensk. Selsk. Christ., 1882, No. 7, 2, c tab.; Nyt Mag. f. Naturvid., XVIII, 1884, 121.—Strom, Norsk. Vidensk. Selsk. Skrift., 1881, 80; 1884, 47.—Günther, Challenger Report, XXII, 11.

"Snout long and pointed; the width of the interorbital space is contained about four times and one-half in the length of the snout. Body above smooth, rough only on the snout and the upper margin of the eye, in some old specimens also along the front margin of the disk; the body below thickly covered with minute asperities. No larger spines on the disk. The tail in the males with a median series (containing about forty spines), but none on the sides; the old females with three series, the median series containing a varying number of spines, some of which are sometimes irregularly crowded together. Between the dorsals there are, as a rule, few spines. The teeth form from forty-one to forty-four series in the upper, and from forty-one to forty-three in the lower jaw. Coloration dark grayish brown above; the mucous pores marked with black vermicular spots. Lower surface blackish, without spots. (*Garman* and *Günther*.)

This species is locally not uncommon on the Norwegian coast; for instance in Throndhjem Fjord, at a depth of 150 to 200 fathoms. It is one of the larger skates, the specimens in the British Museum measuring from 38 to 46 inches in width.

Order HOLOCEPHALI.

Holocephala, MÜLLER, Abhandl. Akad. Wiss. Berlin, 1834, 74.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 348.
Holocephali, GILL, MS.

Selachians distinguished by the confluence of the hyomandibular bone with the cranium, the coalescence of the maxillary and palatine elements with the skull, the development of a rudimentary operculum, and the existence of a single external gill opening on each side behind the head. (*Gill.*)

Family CHIMÆRIDÆ.

Chimæridæ, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 349.

Body rather robust, elongate, tapering posteriorly. Head compressed. Mouth inferior. Upper lip deeply notched. Nostrils confluent with the mouth, separated by a narrow isthmus. Jaws with the teeth confluent into four bony laminæ above and two below. No spiracles. Males usually with a cartilaginous hook on the upper part of the snout, armed with prickles at the tip, and turned forward. Pectoral fins free, placed low. Ventral fins abdominal, many-rayed, provided in the male with claspers. Dorsal fin usually divided, anteriorly with a very strong spine, which is grooved behind. Caudal fin low, fold-like. Skin naked, rarely somewhat prickly. Lateral line present, usually with numerous branches anteriorly. Three free gills and two half gills.

KEY TO THE GENERA OF CHIMÆRIDÆ.

I. Male with cephalic appendage.
    A. Snout soft, not terminating in a cutaneous flap; tail not bent forward.
        1. Posterior appendages tripartite .... CHIMÆRA
        2. Posterior appendages bipartite .... HYDROLAGUS
    B. Snout terminating in a cutaneous flap .... CALLORHYNCHUS
II. Male without cephalic appendage; snout very elongate .... HARRIOTTA

CHIMÆRA, Linnæus.

Chimæra, LINNÆUS, Mus. Ad. Frid., I, 53; Syst. Nat., ed. x, 1758, I, 236.

Holocephali with head somewhat compressed, snout without appendage. Eyes lateral, very large. Lateral line forking anteriorly, forming several series of mucous tubes on the head. Male with a club-shaped, cartilaginous hook above snout, curved forward and downward armed with decurved spines at tip, and fitting into a depression in front of eyes. Ventrals rather large, with large bifid or trifid claspers in the male. Male with also rough appendages at the base of the ventrals, protruding from a sheath of skin. First dorsal triangular, preceded by a strong serrated spine which is grooved behind. Second dorsal and caudal low, often notched. Tail sometimes produced in a filament. Skin smooth.

KEY TO THE SPECIES.

I. Pectorals long, extending to tips of ventrals .... C. MONSTROSA
II. Pectorals short, terminating far in advance of the ventrals .... C. AFFINIS

CHIMÆRA MONSTROSA, LINNÆUS. (Figure 31.)

Chimæra monstrosa, LINNÆUS, Mus. Ad. Frid., I, 53, pl. XXV; Syst. Nat., ed. X. 1758, I, 236; ed. XII, 401.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 349.

Tail terminating in a very long finless filament, about as long as the body and head. The first dorsal fin close to and subcontinuous with the second low dorsal fin, the upper margin of which is even, not notched, except just in front of the caudal fin, which is also low. Each clasper of the male is divided into two long, slender branches, which are rather longer than the snout, and the inner branch is again longitudinally divided into a simply cartilaginous styliform part and another coated with the spiny membrane. Brown, marbled with lighter; dorsal fins with a broad black margin. (*Günther.*)

This species has been found along the coast of Europe from Norway to Portugal, and also off Soudan and at the Azores, but never as yet in North American waters. Individuals have also been taken at the Cape of Good Hope and in the seas of Japan. The *Knight Errant* and the *Triton*, in their exploration of the Faröe Channel, obtained young individuals with their bodies from 1½ to 5 inches in length. These were from a depth of 505 to 555 fathoms. The *Travailleur*, in 1882, obtained in the Gulf of Gascony some very small individuals, the least one only 130 millimeters in length, and still carrying the yolk bag. This, according to Vaillant, was probably in the horny egg case when it was inclosed by the dredge net, and fragments of the horny envelope were attached to it, which proved to be very similar to those figured by Müller and Duméril as the egg case of *Chimæra.*

This discovery is particularly instructive, since, even so late as 1887, Dr. Günther has expressed the opinion that the ova which had been described as Chimæroid probably belonged to *Callorhynchus.* Dr. Günther was of the opinion, in 1880, that there was no well-authenticated egg of *Chimæra* in any collection; but the adult *Callorhynchus* has never been found so far north as the Gulf of Gascony, and Vaillant is probably justified in his conclusion that the familiar form of egg is that of *Chimæra monstrosa* or the closely allied *Chimæra affinis.*

As Dr. Günther has already said, these discoveries show that *Chimæra* is a deep-sea fish, and one which propagates its species in deep water, a circumstance which accounts for the previous scarcity of young individuals in collections.

CHIMÆRA AFFINIS, CAPELLO. (Figures 32–35.)

Chimæra affinis, CAPELLO, Jorn. Math., Phys. e Nat. Lisb., IV, 1868, 311, pl. III, figs. 1, 1a.
Chimæra plumbea, GILL, Bull. Phil. Soc. Washington, Dec. 22, 1877.
Chimæra abbreviata, GILL, Proc. U. S. Nat. Mus., VI, 1881, 254.

A *Chimæra* with the snout acutely produced, the ante-orbital flexure of the suborbital line extending little above the level of the *inferior margin of the orbit; body more elongate* than in *C. monstrosa;* second dorsal removed from the first by interval equal to the length of the base of the latter. Second dorsal much lower than in the other species, and with the free border straight, without undulations. The dorsal spine with its anterior surface rounded; the ventrals triangular and pointed; the pectorals extending to the outer axil of the ventrals. Space between first dorsal and the ventral wide, the pectoral terminating much in advance of the ventral. Caudal fin very small, terminating in a minute filament. Cephalic appendages with five spines on inner surface. Posterior appendages tripartite, but the division of the three portions takes place at two-thirds of the distance from the base; the cylindrical portion is larger and presents a form different from that in the others. Color uniformly plumbeous.

This form is closely allied to *Chimæra monstrosa.* It was first described by Capello from the coast of Portugal, and later by Gill from the North American side of the Atlantic, at depths varying from 200 to 1,200 fathoms. It is very common in the deep water on the outer edges of banks north of Georges Banks, and was formerly often brought in by the Gloucester halibut schooners.

Other specimens have been obtained as follows: No. 22793, U. S. N. M., in 42° 40′ N. lat., 63° 23′ W. lon., off Le Have, at a depth of 350 fathoms; No. 492, U. S. N. M., from Noank Harbor; No. 219, U. S. N. M., in the Gloucester donation; No. 35603, U. S. N. M., in 39° 47′ N. lat., 70° 30′ 30″ W. lon., at a depth of 963 fathoms; No. 2385, U. S. N. M., in 28° 51′ N. lat., 88° 18′ W. lon., at a depth of 730 fathoms; No. 20779, U. S. N. M., in 42° 40′ N. lat., 63° 23′ W. lon., at a depth of 350 fathoms; No. 22296, U. S. N. M. (237, Gloucester donation); No. 22297, U. S. N. M., in 43° 23′ N. lat., 60° 16′ W. lon., at a depth of 300 fathoms; No. 22498 (Gloucester donation), and Nos. 38221, U. S. N. M., from the fishing banks

CALLORHYNCHUS, (Gronov.), Cuvier.

Callorhynchus, GRONOVIUS., Mus. Ichth., I, 59. CUVIER.—Règne Animal, ed. I, 1817, II, 140.

Snout with a cartilaginous prominence, terminating in a cutaneous flap. Two dorsal fins, the anterior with a very long and strong spine. Extremity of the tail distinctly turned upwards, with a fin along its lower edge, but without one above. Anal fin close to the caudal, short and deep.

The typical species of this genus, *C. callorhynchus* (L.) [=*C. antarctica* (Lacépède) Cuvier], has been hitherto found only in the Antarctic basin and the South Pacific.

HYDROLAGUS, Gill.

Hydrolagus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 331.

Holocephali closely allied to *Chimæra*, but with no filament at the tip of the tail, and with bipartite posterior appendages.

HYDBOLAGUS COLLIEI, (BENNETT), GILL.

Chimæra Colliei, BENNETT, in Beechey's Voy., Zoöl., 71, pl. 23, figs. 1 and 2.—GIRARD, U. S. & Pac. R. R. Exped., Fish. 360.—DUMÉRIL, Elasmobr., 689.
Hydrolagus Colliei, GILL, Proc. Ac. Nat. Sc. Phila., 1862, 331.

Tail simply tapering, without filament. Three dorsal fins, besides the caudal: the first, with the spine, is separated by a considerable interspace from the second; the three other fins low, subcontinuous. Each clasper of the male is divided into two club-shaped branches, which are rather shorter than the snout; both branches coated with the spiny membrane, and the inner is not subdivided. Brown, silvery, upper parts with round yellow spots. This form occurs only in the North Pacific. It is abundant about Puget Sound, and in southeastern Alaska. It swims at the surface, and is abundant about the wharves at Esquimalt, where it is called the "Ratfish."

There is no evidence that it descends to very considerable depths.

HARRIOTTA, Goode and Bean, n. g.

Snout exceedingly elongate, with a cartilaginous midrib, and foliaceous lateral expansions of the skin at its base. Two dorsal fins, the anterior with an immense triangular spine, finely serrated, upon its lateral edges. Anal fin reduced to a cutaneous fold. Longitudinal axis of the tail nearly the same as that of the trunk, very elongate, with filamentous tip, the fin below much more extensive than that above. No cephalic organ. Gill-openings lateral; separated by a wide isthmus. Claspers small and simple.

This genus is named in honor of Thomas Harriott, the most eminent philosopher and naturalist of his day in England, who was a member of Raleigh's Roanoke colony in Virginia in 1585, and who published the first work in English on American natural history.

HARRIOTTA RALEIGHANA, GOODE and BEAN, n. s. (Figures 37-40.)

Tail extended in a very long filament, much longer in the older individuals than in the young, in which no filament exists. The first dorsal fin separated from the second by an interval nearly equal to the diameter of the eye in the older individuals, very much greater in the younger ones, in which the cartilaginous portion is exceedingly narrow and high. The second dorsal fin long and low, its height about equal to the diameter of the eye, its length equal to that of the head. The spine preceding the first dorsal fin is very strong; its length in the older individuals equal to the distance from its own base to the origin of the second dorsal; in the young it is proportionately much longer and stouter, and there is also a double row of strong spines in advance of the second dorsal, and in the notch between the second dorsal and its continuation upon the upper part of the tail; and there is a similar group of at least six strong spines upon the top of the head back of the interorbital space, and surrounded by the curve of the forward extension of the lateral line. Traces of these spines may be felt beneath the skin in older individuals of both sexes. Claspers in the young male examined, small and simple, in length scarcely equal to two thirds of the long diameter of the eye. Pectoral fins immense, wing-like, rounded in the young, subfalcate in the older individuals; inserted slightly in advance of the origin of the first dorsal, and extending in the older forms beyond the root of the ventral. Ventrals also subfalcate; similar in form and appearance to the pectoral, and extending to a point at two thirds of the distance from the origin to the end of the second dorsal; in length little less than half the snout. In the young the ventrals are placed somewhat farther back and reach to a point under the origin of the third section of the dorsal fin. The tail is prolonged in a slender filament, and in the older individuals the cutaneous flap upon its lower edge is three or four times as deep as that above, and extends beyond it anteriorly and posteriorly. In the younger specimens the upper and lower flaps are about equal in height, and the upper flap extends far in advance of the insertion of the lower one. The lateral line extends in a straight line from a point beneath the origin of the first dorsal approximately to the middle of the lower caudal lobe, which it follows along its base for the remainder of its course; in advance of the dorsal fin it bends downward in an elliptical course, and then rises vertically from the occiput to join its counterpart from the other side; bridle like extensions of the same system extend on the sides of the head under the eyes, curving upward in front of the eye, then downward and joining on the under side of the snout to a branch running from beneath the eye downward to the base of the pectoral fin in the young, or under the throat to a junction in the older ones, and also forward from the same point under the eyes to join on either side the circle which surrounds the mouth. An elaborate system of mucous pores upon all sides of the snout; on the under surface of the snout in four longitudinal series. In the older individuals there is an extension of the lateral line system on either side of the midrib on the snout to its tip, and there are also symmetrical continuations of the same upon the under surface of the snout. Color, brown; caudal filament pale.

The diameter of the eye is contained 5½ times in the length of the snout in the older specimens, and the distance between the eyes is equal to their diameter.

Of this species we have seen four specimens, the largest, a female (No. 39415, U. S. N. M.), 25 inches in length, from 39° 44′ 30″ N. lat., 70° 30′ 15″ W. lon., in 1,081 fathoms, taken by the steamer *Albatross*. Another, a male (No. 38200, U. S. N. M.), 19½ inches in length, was taken by the *Albatross* in 36° 45′ N. lat., 74° 28′ 30″ W. lon., at a depth of 781 fathoms. A third, a young individual (No. 35520, U. S. N. M.), 4 inches in length, was obtained by the *Albatross* in 39° 37′ 45″ N. lat., 71° 18′ 45″ W. lon., in 991 fathoms. Still another, No. 35631, was taken at station 2235, lat. 39° 12′, lon. 72° 03′ 30″, 707 fathoms.

The species is named in honor of Sir Walter Raleigh, by whom the first English scientific explorer was sent to the New World.

Order MALACOPTERYGII.

Symplectic present. No interclavicles. A mesocoracoid arch. Anterior vertebræ simple. No Webberian ossicles. Pharyngeal bones simple above and below, the lower not falciform. Gills four, a slit behind the fourth. (*Gill.*)

KEY TO THE DEEP-SEA FAMILIES.

Mesocoracoid well developed as a bridge between the hyper- and hypo-coracoid. (Gill.)
I. No barbel and no photophores. Maxillaries form margin of upper jaw.
A. Adipose fin absent. Body scaly.
1. Dorsal fin similar to and opposite anal. No air-bladder .... ALEPOCEPHALIDÆ
2. Dorsal fin similar to and opposite anal. Air-bladder present .... PTEROTHRISSIDÆ
B. Adipose fin present.
1. Gill membranes separate and free from isthmus. Stomach cæcal.
a. Branchiostegals, 6 or more .... ARGENTINIDÆ
b. Branchiostegals, 4 or less .... MICROSTOMIDÆ
2. Gill membranes joined, forming broad bridge across isthmus; gill cavity closed behind.
a. Ventrals opposite posterior end of dorsal .... BATHYLAGIDÆ
Mesocoracoid wanting or atrophied. (Gill.)
I. Post-temporal connected with back of cranium near sides. No photophores or barbel.
A. Adipose fin typically present.[1] Body not very elongate. Anal distinct.
1. Scales present, persistent (in all Atlantic forms). Teeth cardiform or villiform.
a. No photophores. Teeth cardiform, usually hinged.
i. Maxillary narrow or rudimentary. Hypocoracoids not divergent .... SYNODONTIDÆ
ii. Maxillary dilated behind.
* Pectorals normal. Hypocoracoids divergent .... AULOPIDÆ
** Pectorals subhumeral .... BENTHOSAURIDÆ
*** Pectoral rays elongate, in two groups .... BATHYPTEROIDÆ
B. Adipose fin absent.
1. Scales large, thin, and deciduous. Teeth villiform, in bands.
a. No photophores on the scales, but a large, luminous, cephalic plate.
i. Maxillary dilated behind.
* Pectorals and ventrals well developed, approximate .... IPNOPIDÆ
2. Body scaleless.
a. Teeth granular, in bands. Pectorals normal.
i. Ventrals present. Opercular apparatus incomplete .... RONDELETIIDÆ
ii. Ventrals absent. Opercular apparatus complete; a conspicuous lateral furrow.
CETOMIMIDÆ
II. Post-temporal impinging upon occiput.
* Vertebræ and neural spines normal.
A. Photophores present, barbel absent.
1. Pseudobranchiæ present.
a. Premaxillaries forming margin of upper jaw. Body scaly .... MYCTOPHIDÆ
b. Maxillary and intermaxillary together forming margin of upper jaw. Body naked. Opercular apparatus incomplete .... MAUROLICIDÆ
2. Pseudobranchiæ absent. Mouth large, with strong canines. Scales deciduous.
a. Dorsal in front of ventrals. Anal short. Canines immense. Operculum incomplete.
CHAULIODONTIDÆ
b. Dorsal behind ventrals. Anal long. Operculum well developed .... GONOSTOMIDÆ
B. Photophores and barbel both present.
1. Maxillaries forming lateral margin of upper jaw.
a. Adipose fin present. Pectorals present.
i. Body naked. Dorsal behind vent, but in advance of anal .... ASTRONESTHIDÆ
b. Adipose fin absent. Pectorals usually present (absent in *Photonectes*) .... STOMIATIDÆ
2. Premaxillaries only forming margin of upper jaw.
a. Pectorals rudimentary. Opercula membranaceous.
i. Body scaleless. Dorsal short, postmedian .... MALACOSTEIDÆ
C. Photophores and barbel absent.
1. Premaxillaries forming margin of upper jaw. Fang-like teeth in mandibles and palatines and sometimes on vomer.
a. Dorsal long, occupying entire back. Body naked .... ALEPISAURIDÆ

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[1] Absent in *Benthosaurus* and sometimes in *Bathysaurus*.

b. Dorsal short, postmedian. Scales thin, caducous........................Paralepididæ
c. Dorsal short, median. Body naked..Odontostomidæ
** Vertebræ normal. Anterior neural spines abnormally developed, projecting through the skin of the back, in advance of the dorsal.
1. Body compressed, ventradiform, carinated.
a. Mouth obliquely cleft, or subvertical......................................Sternoptychidæ
*** Vertebræ with spiny processes anteriorly which project through the skin of the back in front of dorsal rays.
1. Pectorals absent. Body elongate.
a. Body naked. Dorsal beginning in advance of the vent......................Idiacanthidæ

Family ALEPOCEPHALIDÆ.

Alepocephales, **Cuvier & Valenciennes**, Hist. Nat. Poiss., XIX, 169.
Alepocephalidæ, **Richardson**, Encyc. Britannica, 8th ed., 1856, 255.—**Günther**, Cat. Fish. Brit. Mus., VII, 1868, 477.—**Gill**, Arrangement, Families of Fishes, 17.—**Jordan** and **Gilbert**, Bull. XVI, U. S. Nat. Mus., 257.
Alepocephaloidei, **Bleeker**, Enum. Spec. Pisc. Arch. Ind., 1859, XXX.

Malacopterygians with body more or less compressed, covered with thin cycloid or keeled scales, or with naked, prickly skin. Head naked. No barbels. Mouth moderate or large, the margin of the upper jaw formed by the premaxillaries and maxillaries, the former placed along the upper anterior edge of the latter. Opercular apparatus complete. Teeth feeble. No adipose fin. Dorsal fin long and low, posterior, inserted opposite the anal; pectorals short, placed rather high; ventrals usually well back, sometimes wanting. Pseudobranchiæ present. No air bladder. Stomach curved, without blind sac. Pyloric cæca in moderate number. Gill openings very wide.

KEY TO THE GENERA OF ALEPOCEPHALIDÆ.

I. Body covered with scales.
  A. Ventrals present.
    1. Maxillaries toothless; mouth of moderate width; scales thin, cycloid.
      a. Dorsal and anal similar and nearly equal; body oblong ....Alepocephalus
      b. Anal much longer than dorsal; body elongate ....Conocara
    2. Maxillaries toothed; mouth wide.
      a. Gill openings narrow, teeth in premaxilla and mandible uniserial..........Bathytroctes
      b. Gill openings wide, teeth in premaxilla and mandible pluriserial..........Narcetes
  B. Ventrals absent; scales small, keeled; body abbreviated, high, much compressed..........Platytroctes
II. Body scaleless.
  A. Dorsal normal, equal in length to anal; scales replaced by nodules.
    1. Lateral line present..........Xenodermichthys
    2. Lateral line absent..........Aleposomus
  B. Dorsal normal, shorter than anal..........Leptoderma
  C. Dorsal preceded by a long adipose fold..........Anomalopterus
III. Body with minute, hardly imbricate scales.
  A. Pseudobranchiæ quite rudimentary.
    1. Bones of the head produced in a long snout..........Aulostomatomorpha

ALEPOCEPHALUS, Risso.

Alepocephalus, **Risso**, Mem. Accad. Nat. Sci. Turin, XXV, 1820, 270.—**Müller**, Abhandl. Akad. Wiss. Berlin, 1846, 171.—**Cuvier** and **Valenciennes**, Hist. Nat. Poiss., XIX, 169.—**Günther**, Cat. Fish. Brit. Mus., VII, 477.—**Jordan** and **Gilbert**, Bull. XVI, U. S. Nat. Mus., 257.

Body oblong, compressed. Mouth moderate, the snout somewhat prolonged. Jaws nearly even in front; a series of small teeth in each jaw and on the vomer and palatines. Eye very large. Gill membranes entirely separate. Branchiostegals 6. Opercular bones thin. Dorsal low and rather long, with a scaly base, opposite and similar to the anal. Pectorals and ventrals rather small. Caudal moderately forked. Scales rather large, thin and cycloid.

KEY TO THE SPECIES OF ALEPOCEPHALUS.

1. Opercular flaps voluminous; head large.
  A. Head one-third of total or nearly so.
    1. Scales large (50–55, in lat. line). Snout, 10 in body length. Eye, 3¼ in head........A. ROSTRATUS
    2. Scales moderate (67 in lat. line). Snout, 9 in body. Eye, 4 in head................A. PRODUCTUS
    3. Scales moderate (70 in lat. line). Snout 10½ in body. Eye 3½ in head..............A. BLANFORDII
    4. Scales small (about 90 in lat. line). Snout, 12 in body. Eye, 3¼ in head.............A. AGASSIZII
  B. Head less than one-third of total.
    1. Scales very small (about 140 in lat. line). Snout, 10 in total. Eye 6 in head............A. NIGER
I. Opercular flaps moderate; head moderate.
    1. Scales large (65 in lat. line). Snout 18 in body. Eye 4¼ in head ....A. BAIRDII
    2. Scales large (62 in lat. line). Snout 15 in body. Eye 6 in head ....A. BICOLOR
    3. Scales large (50 in lat. line). Snout 18 in body. Eye 4½ in head ....A. EDENTULUS

There are two distinct groups in *Alepocephalus*, probably of subgeneric value. The first group includes the type, *A. rostratus*, Risso. It is characterized by a somewhat short, compressed body, large head, with extended membranaceous flaps, and by short dorsal and anal fins, similar in size and shape and nearly opposite each other.

A. rostratus has the largest scales, 50 to 55 in the lateral line (Vaillant claims to have counted 71 on a large individual), and has a comparatively large eye and snout.

A. Agassizii has somewhat smaller scales (about 90 in the lateral line), a comparatively larger head (3 in total), and the eyes slightly larger (3½ in head, 10½ in body).

A. productus has a smaller eye than *A. Agassizii*, and a longer snout, it being about one-third of the length of the head. In *A. rostratus*, however, the snout length is one-tenth of the total; in *A. productus* one-twelfth.

A. Blanfordii, Alcock (Ann. and Mag. Nat. Hist., 1892, ii, 357), from the Indian Ocean, has an immense eye.

A. niger of Günther is a somewhat slenderer form, with very small scales.

All of these forms are dull in color and have the ventral fins weak and inconspicuous.

A. Bairdii represents another type, having a stout body, about as high in proportion to its length as in *A. Agassizii*, etc., but with a smaller head and less voluminous opercular flaps The eye is comparatively much smaller (18 in total length), and is nearer the upper profile of the head. The vertical fins are stronger and more muscular, and are heavily scaled at their bases. Lateral line nearly straight. Maxillaries slender, not expanded posteriorly.

A. bicolor, Alcock (Ann. and Mag., 1891, ii, 133), is from the Indian Ocean, 240–76 fathoms.

A. edentulus, Alcock, *l. c.* is from the Indian Ocean, 475 fathoms.

ALEPOCEPHALUS ROSTRATUS, RISSO. (Figure 41.)

Alepocephalus rostratus, RISSO, Mem. Accad. Torin., XXV, 1820, 291, pl. X, fig. 4; Hist. Nat. de l'Europe Méridionale, 449, fig. 27.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XIX, 169, pl. 532.—JOHNSON, Ann. and Mag. Nat. Hist., X, 1862, 285.—GÜNTHER, Cat. Fish. Brit. Mus., VII, 477.—MOREAU, Hist. Nat. Poiss. France, III, 463.—GEGENBAUR, Morphol. Jahrbuch, IV, Suppl., 1, pl. 1, 2 (skull).—GIGLIOLI, Elenco, 1883, 106.—VAILLANT, Exp. Sci. Trav. et Talisman, Poissons, 148, pl. XI, fig. 1; pl. XII, fig. 5.

The height of the body is a little more than one-fifth of the total length (without caudal); the length of the head is a little less than one-third. Diameter of the eye contained thrice and one-fourth in the length of the head, and longer than the snout. Scales much longer than wide, with the anterior (radical) margin truncated. Origin of the dorsal fin opposite to the vent. Pectoral fin longer than orbit. Distance of ventral fin from the head three-fifths the length of the latter. Uniform deep black. (*Günther*.)

Radial formula: B. 6; D. 16, 17; A. 18, 19; P. 13; V. 8; L. lat. 55; Cœc. pyl. 12.

This species occurs in the deeper waters of the Mediterranean, and was described by Risso in 1820. Until 1874, when the *Challenger* began her work, this was the only representative of the family known to ichthyology.

The French expedition obtained twenty-four specimens from off the coasts of Soudan and Morocco, from about 830 to 2,190 meters, from the Banc d'Arguin; from the Canaries, 975 meters; the Azores, 2,235 meters, and the Cape Verde Islands, 3,655 meters. Günther is disposed to believe that *Esunculus Costai* is the young of this species.

ALEPOCEPHALUS AGASSIZII, GOODE and BEAN. (Figure 45.)

Alepocephalus Agassizii, GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 218, 1882.—JORDAN, Cat. Fish. N. Amer., 1885, 34.—GÜNTHER, Challenger Report, XXII, 223.

Height of body slightly more than five times in its length; its width about half its height; caudal rays somewhat compressed. Least height of the tail, 12 times in length of the body.

Scales ovate-lanceolate, parchment-like, smaller than in *A. Bairdii* (the specimen is almost denuded of scales, and their arrangement in the drawing has been in part made out from their impressions upon the skin). There are 90 scales in the lateral line, 10 between lateral line and origin of dorsal, 11 between same and origin of anal. Base of dorsal is squamose, anal slightly so.

Head somewhat compressed, its length contained 3 times in the length of the body, slightly exceeding twice the length of the lower jaw, and 4 times the least height of tail. Snout conically elongate, the lower jaw slightly produced. Width of head slightly less than length of operculum, and 9½ times in length of body. Dentition as in *A. Bairdii*.

Length of snout half that of mandible, which is one-sixth of total length. Diameter of orbit 10½ in total length of body.

Insertion of dorsal immediately above vent; the distance of its origin from the base of middle caudal rays equal to one-third of distance from same to anterior margin of orbit, and at distance from snout much greater than two-thirds total length of body. The length of its base is equal to one-eighth of total length.

Origin of the anal is under second ray of dorsal; its length of base slightly more than one-seventh of body length, and equal to height of the body at vent.

Distance of pectoral from snout equal to one third of body length and 4½ times least height of tail. Its length equal to the diameter of orbit and contained 10½ times in total length. Origin of pectoral is close behind the end of the opercular flap, while in *A. Bairdii* it is separated therefrom by four rows of scales.

Distance of ventral from snout considerably less than twice the length of the head. Its length (probably) about one-sixth that of the head.

Radial formula: D. 15; A. 17; C. 19; P. 11; V. 1, 5 (?); L. lat. 90.

Color dark, head and fins nearly black.

A single specimen was obtained at station 338, in 922 fathoms, lat. 38° 18′ 40″ N., lon. 73° 18′ 10″ W.

Other specimens were obtained by the *Albatross* as follows: No. 38209, U. S. N. M., 8¾ inches in length, in 36° 30′ N. lat., 74° 33′ W. lon., at a depth of 859 fathoms; No. 35518, U. S. N. M., from station 2201 in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms; No. 33391, U. S. N. M., from station 2072 in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; No. 33377, U. S. N. M., from station 2075 in 41° 40′ 30″ N. lat., 65° 35′ W. lon., at a depth of 855 fathoms; No. 33325, U. S. N. M., from station 2051 in 39° 41′ N. lat., 69° 20′ 20″ W. lon., at a depth of 1,106 fathoms; No. 35030, U. S. N. M., from station 2233 in 38° 36′ 30″ N. lat., 73° 06′ W. lon., at a depth of 620 fathoms; and two others, one from station 2530 in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms, and one from station 2117 in 15° 24′ 40″ N. lat., 63° 31′ 30″ W. lon., at a depth of 683 fathoms.

ALEPOCEPHALUS PRODUCTUS, GILL. (Figure 46.)

Alepocephalus productus, GILL, Proc. U. S. Nat. Mus., VI, 1883, p. 256.—GÜNTHER, Challenger Report, 1887, p. 223.

An *Alepocephalus* resembling *A. Agassizii* in form and proportions, but with larger scales, smaller eye, and longer snout.

The body is quite robust, its height at the pectoral origin nearly one-fourth of the length from the snout to the base of the median caudal rays. Least height of the tail about one-half the body in length. The head forms more than one-third (35.5) of the total length. The snout equals one-third of the length of the head, the eye nearly one-fourth, and the posterior margin of the orbit is nearly equidistant between the snout and the opercular margin. The upper jaw extends a little behind the vertical from the posterior margin of the pupil; the lower jaw is shorter and included by the upper, and is nearly one-half as long as the head. The width of the cranium between the orbits is one-seventh of the length of the head, and behind the orbits, more than one-third. The insertion of the dorsal is above the vent; the length of its base is twice the diameter of the eye. The anal base is under the anterior portion of the dorsal, and the length of its base is about three-fourths that of the dorsal. The caudal fin has its median rays as long as the diameter of the eye, and the external rays at least one-fifth of the total length of the fish. The pectoral commences at a distance from the snout equal to one-fourth of the length of the body. The ventrals are inserted considerably behind the middle of the length (0.57), and appear to have been at least as long as the diameter of the orbit.

Radial formula: D. 17; A. 17; scales 9, 67, 12.

The type of this species (No. 33341, U. S. N. M.) was obtained by the *Albatross* from station 2035, in 39° 26′ N. lat., 70° W. lon., at a depth of 1,362 fathoms.

The preliminary description published by Gill was very brief. The fuller description here presented was prepared by him at the time of his original studies.

Alepocephalus niger (Figure 42) is a small-scaled black form inhabiting the seas north of Australia, and obtained by the *Challenger* at a depth of 1,400 fathoms.[1]

ALEPOCEPHALUS BAIRDII, GOODE AND BEAN. (Figure 47.)

Alepocephalus Bairdii, GOODE and BEAN, Proc. U. S. Nat. Mus., II, 1879, 55 (with full measurements of type).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 257.—JORDAN, Cat. Fish. N. A., 34.—GÜNTHER Challenger Report, XXII, 224.

Body comparatively elongate, somewhat compressed, its greatest height, at a point midway between pectoral and ventral insertions, contained 5⅓ times in its length to the origin of the middle caudal rays, its greatest width equal to one-tenth of total length, the least height of tail contained 11 times in length of body.

Scales large, thin, oblong, triangular at the free end, those at the base of the anal fin having the free end more produced than the others. Sixty-five scales in the lateral line, seven rows between it and the origin of the dorsal, eleven between that of the anal and the lateral line. Scales extend for a short distance upon the bases of the dorsal and anal fins.

Head moderately compressed, snout subconical, the lower jaw included. The length of the head is contained 4⅓ times in length of body, slightly exceeding twice the length of the lower jaw. Width of the head equal to the length of the operculum and very slightly less than that of the upper jaw. Width of interorbital area half of the least height of tail. Length of snout half that of the mandible, which is one-ninth of the total length. Diameter of orbit equal to length of snout.

Dorsal inserted directly above the vent, slightly in advance of the anal and at a distance from the snout nearly equal to two-thirds of the total length of the body.

Length of longest ray of dorsal one-half that of the postorbital portion of the head. The distance of the anal from the snout is almost 3 times the length of the head, its first ray being about under the fourth ray of the dorsal. Its length of base is greater than that of the dorsal by one-fifth of the length of the latter; its longest ray slightly exceeds the longest of the dorsal.

Middle caudal rays equal in length to longest ray of anal, the external rays somewhat more than twice as long.

Distance of pectoral from snout 3 times as great as the least height of the tail; its length one-tenth of total length and equal to width of body, reaching to ninth row of scales.

Distance of ventral from snout equal to twice the length of the head, its length slightly greater than that of middle caudal rays.

Radial formula: B. 6; D. 22; A. 25; C. 19; P. 12; V. 1, 9. Pyl. Cæc. 15.

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[1] Challenger Report, XXII, 224, pl. LVI, fig. B.

Color, uniform indigo-blue, this color extending to the inside of the mouth and the gill membranes; fins and opercula black.

The type of this species was obtained by Christian Johnson, of the schooner *William Thompson*, of Gloucester, on the Grand Banks, at a depth of 200 fathoms.

CONOCARA, Goode and Bean, n. g.

Body elongate, compressed; in the type species strongly suggestive of the Barracuda (*Sphyræna*). Mouth moderate. Snout prolonged. Jaws strong and powerful, the lower slightly included. Teeth in the jaws acicular, rather numerous; also on the vomer, very small; absent from palatines. Eye large. Gill membranes entirely separate. Dorsal moderate in length; anal very elongate, nearly twice as long as the dorsal. Pectoral and ventral small. Caudal strongly forked. Scales minute and deciduous. Branchiostegals 6, the membrane of the left series folded conspicuously over the origin of that of the right. Opercular bones thin. Gill rakers rather short and stout, moderate in number.

CONOCARA McDONALDI, GOODE and BEAN, n. s. (Figure 48.)

Body elongate; its height 5¾ in its length without caudal; thickness about 12 times. The length of the head is contained about 3⅓ times in the total length. It is somewhat elongate, and corresponds in appearance with *A. macropterus*, Vaillant. The snout is two-fifths the length of the head, compressed, and with an obtuse point; the lower jaw included within the upper. Mouth large, the upper jaw about one third of the length of the head; the maxillary not reaching to the front of the eye. Mandible reaches to below the middle of the eye. Teeth on the premaxillary, vomer, and palate very sharp, minute, widely separated, in a single row in each jaw. Diameter of the eye contained 5 times in that of the head, twice in that of the snout. Nostrils lateral; posterior very much larger, its distance from the eye half the length of the eye. Gill openings wide; opercular apparatus membranous, its elements being very imperfectly ossified. Fifteen gill rakers on the first arch below the angle. Scales very small, about 200 in the lateral line. Dorsal fin short, about half as long as the anal fin, and its posterior rays inserted nearly over the last rays of the latter. The distance of its insertion from the tip of the snout about 5½ times its own length; the anal inserted at a distance from the snout equal to 2⅓ times its own length. Ventral inserted nearly midway between the snout and the base of the caudal. Pectoral short, in length double the diameter of the eye, and inserted below the median line of the body. Caudal fin short, its middle rays not more than two-thirds the length of the snout, forked. Color, uniform deep blue-black in life.

Radial formula: D. 18; A. 36; P. 10; B. 6; C. approximately 22; V. 6.

A specimen 8½ inches in length was obtained by the *Blake* at station CLXXII, in 24° 36′ N. lat., 84° 5′ W. lon., at a depth of 955 fathoms, and another, 6 inches long, from station CLXV in lat. 24° 36′ N., lon. 84° 05′ W. at a depth of 955 fathoms. Another, 8¼ inches long, was taken by the *Albatross* at station 2392 (lat. 28° 47′ 30″, lon. 87° 27′).

The species is dedicated to Colonel Marshall McDonald, U. S. Commissioner of Fisheries, who has aided so extensively and efficiently the study of the deep-sea fauna.

CONOCARA MACROPTERA, (VAILLANT), GOODE and BEAN. (Figure 43.)

Alepocephalus macropterus, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 1888, 150, pl. XI, fig. 2a, 2b, 2c.

Body very elongate; its height contained 8 times in the length of the body; its thickness 11 times.

The head, which constitutes one-fourth of the total length, is elongated; the snout is two-fifths of the length of the head, compressed, and with an obtuse point Mouth moderate, the upper jaw extending considerably beyond the lower, the maxillary scarcely reaching to the anterior margin of the orbit. Teeth on the premaxillaries, maxillaries, vomer, and palatines, conical, elongated, rather small, and in a single row in each jaw. Nostrils wide, close together, the anterior near the middle of the length of the snout. Eye large; its diameter three-elevenths of the length of the head; interorbital space two-elevenths. Gill opening wide; operculum for the most part membranaceous, its elements being very imperfectly ossified; preoperculum curved, thickened on its anterior edge; the interoperculum and suboperculum not prominent, and apparently replaced in part by the branchiostegals. Gill rakers, about 15 below angle.

The vent is a little behind the middle of the total length. Lateral line extending from the upper part of the branchial opening to the middle line of the body. Scales remarkably small; those of lateral line very simple and more than a hundred in number.

Dorsal with its outline a little convex, lower behind and ending at a distance from the caudal equal to the length of its own base, which is equal to about one-eighth of the length of the body; anal more than twice as long, beginning near the vent and terminating a little behind the dorsal. Its height nearly the same as that of the dorsal. Caudal moderately long; its length equal to one-seventh of the length of the body, slightly emarginate; pectoral small; ventrals very short.

Color reddish brown; head a beautiful azure-blue; fins sepia; iris black; pupil azure-blue.

Scales very simple in form; those of the body are rounded in outline and measure from 1.5 to 1.6 mm., in diameter. Five pyloric cœca, moderately elongated. No trace of a swim bladder.

Radial formula: B. 6; D. 21; A. 40; P. 8; V. 5.

Sixteen specimens of this species were obtained by the French expedition from the coast of Morocco to Soudan, from the Banc d'Arguin, and from the Canaries, at depths varying from 865 to 2,115 meters. A specimen 8 inches in length was obtained by the *Albatross* at station 2751, lat. 16° 57′ N., lon. 63° 12′ W., in 68 fathoms.

BATHYTROCTES, Günther.

Bathytroctes, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 249; Challenger Report, XXII, 225; Study of Fishes, 664.

Body rather elongate, compressed, covered with scales of moderate size. Cleft of the mouth rather wide, the maxillary extending to below the middle of the eye. Both intermaxillary and maxillary armed with a series of minute teeth, as is also the mandible; palatine bones with similar teeth; those on the latter often weak and deciduous. Vomerine teeth present or absent. No teeth on the tongue. Eye very large. Dorsal and anal fins moderately long, the former behind the ventrals. Adipose fin none. Caudal forked. Gills very narrow; pseudobranchiæ present; gill rakers long, lanceolate. Pyloric appendages in moderate number. Ova rather small.

Bathytroctes is closely allied to *Alepocephalus*, from which it differs chiefly in the presence of teeth on the maxillary. Ten species have been described, seven of which are from the Atlantic. One of these, *B. attritus*, is, by the admission of its describer, quite as likely to belong to some other genus—perhaps *Alepocephalus*.

The type of this genus is *Bathytroctes macrolepis*, Günther, from a depth of 2,150 fathoms, north of Celebes (*Challenger* station XCVIII).—*B. squamosus*, Alcock is from 740 fathoms in the Arabian Sea. *B. stomias*, Gilbert, is from 877 fathoms, off Oregon and Washington.

KEY TO THE SPECIES OF BATHYTROCTES.

I. Dorsal fin far in advance of the anal .... BATHYTROCTES
  A. Anal inserted nearly below middle of dorsal. Maxillary reaching to below posterior third of orbit.
    1. Scales large (42 in lat. line). Vertical fins short. (D. 15; A. 11.) [BATHYTROCTES MACROLEPIS]
    2. Scales moderate (57 in lat. line) Vertical fins moderate. (D. 17; A. 14). Mouth very large. [B. STOMIAS]
    3. Scales small (100 ? in lat. line). Vertical fins moderate. (D. 20; A. 17.) .... B. ROSTRATUS

B. Anal inserted far behind middle of dorsal.

- 1. Maxillary extending to below posterior third of orbit. Scales moderate (70). Dorsal and anal nearly equal in length. (D. 16; A. 17.)..B. MICROLEPIS
- 2. Maxillary extending behind posterior margin of orbit. Scales small (ca. 105 in lat. line). Dorsal longer than anal. (D. 14; A. 11.)..B. MELANOCEPHALUS

II. Dorsal and anal nearly opposite and equal in length or nearly so..............................TALISMANIA

- 1. Maxillary extending about to vertical middle of orbit.
- a. Scales moderate (64 in lat. line). (D. 16; A. 17.)..B. HOMOPTERUS
- b. Scales rather large (about 50 in lateral line), D. 17–18; A. 17–18..............................B. SQUAMOSUS
  - 1. Maxillary to vertical from anterior margin of orbit. (D. 20; A. 22.).............B. ANTILLARUM
  - 2. Maxillary to vertical from posterior margin of orbit. (D. 22; A. 21.).............B. ÆQUATORIS

BATHYTROCTES MACROLEPIS, GÜNTHER. (Figure 44).

Bathytroctes macrolepis, GÜNTHER, Challenger Report, XXII, 225, 1887, pl. LVII, fig. b (two views of head).

A *Bathytroctes* with the dorsal fin far in advance of the anal, and the maxillary reaching to below the posterior third of the orbit. Large scales and short vertical fins. The height of the body is two-elevenths of its length; the head slightly more than one-third. Head depressed, elongate, scaleless; broad across the occipital region, tapering forward; its upper surface deeply concave longitudinally. Eye large; its diameter greater than the length of the snout and 3½ in length of head. Interorbital space half the diameter of the eye. Snout pointed. Jaws equal. Cleft of mouth rather wide; the maxillary extending beyond the vertical from the center of the eye. Dentition weak; teeth small, equal, pointed, uniserial; intermaxillary and front of maxillary toothless; vomerine teeth in two groups; palatine teeth few, about 9.

Vent about midway between the branchial opening and the caudal. The dorsal insertion is in advance of the vertical from the vent, and it last ray opposite the fourth ray of the anal. Dorsal and anal both high in front. Pectoral lateral, its insertion opposite the lower half of the gill opening. Pectoral with broad base, extending beyond the vent to the end of the anal. Its insertion is midway between the root of the pectoral and the end of the anal, and directly in advance of the vertical from the insertion of the dorsal. Scales small, cycloid. Lateral line straight, with wide mucous apertures. Color, uniform black.

Radial formula: D. 15; A. 11; V. 8; L. lat. 42.

A single specimen, 9 inches in length, in poor condition, was obtained by the *Challenger* at station CXCVIII, north of Celebes, at a depth of 180 fathoms.

As the type of the genus its characters are here introduced, for purposes of comparison.

BATHYTROCTES ROSTRATUS, GÜNTHER.

Bathytroctes rostratus, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 250; Challenger Report, XXII, 1887, 227, pl. LVIII, fig. 13.

The maxillary reaches to below the hind margin of the orbit; intermaxillary terminating in front in a short projection.

The height of the body is nearly one-fifth of the total length (without caudal); the length of the head one-third. Bones of the head very thin and very easily ruptured, like all the other parts of the body. Head compressed, moderately deep, its depth at the occiput being three-fifths of its length; its upper surface longitudinally concave, the width of the interorbital space being more than one-half of the longitudinal diameter of the eye. Eye large, a little longer than deep, contained thrice and two-thirds in the length of the head and equal to that of the snout. Infraorbital ring narrow, the broad and large maxillary being separated from the orbit by a narrow strip of bone. Snout wedge-shaped, with a pair of short and flat projections in front, each being formed by the intermaxillary and toothed at its extremity. The cleft of the mouth is wide, the maxillary extending to below the hind margin of the orbit. Dentition very feeble, all the teeth being minute and uniserial. The intermaxillary and maxillary are toothed throughout their whole extent; the teeth of the mandible are particularly minute, and the series is interrupted close to the symphysis, the symphyseal portion being external to the lateral portion, which is implanted on the upper edge of the bone. The vomerine teeth are reduced to a pair of very small teeth in the middle of the bone. Palatine teeth none, or reduced to a single tooth-like projection.

Branchiostegals long, narrow, slender. Gills as in *Bathytroctes macrolepis*. Gill rakers long, lanceolate, closely set, 20+7 on the outer branchial arch.

Vent nearer to the gill opening than to the root of the caudal. Origin of the dorsal fin somewhat in advance of the vent; it is much longer than high, the length of the anterior rays increasing to the sixth or seventh ray. Origin of the anal fin below the anterior half of the dorsal, which it resembles in shape. Caudal fin deeply emarginate. Pectoral inserted a short way above the lower profile, rather short and broad, about as long as the eye. Ventrals broad, extending to the vent, their root being rather nearer to the base of the caudal than to the extremity of the snout.

Scales simple, cycloid, in about 12 longitudinal series above and below the lateral line, between the dorsal and ventral fins. Lateral line straight, running from the upper end of the gill opening along the middle of the tail, with rather small mucous apertures.

Color, uniform black.

Radial formula: D. 20; A. 17; V. 9; P. 16; L. lat. ca. 100.

A specimen 6½ inches long was taken by the *Challenger* off Pernambuco, station CXX; depth, 675 fathoms.

A very small, pointed, osseous projection in front of the clavicular symphysis reminds us of a similar peculiarity in the following genus *Platytroctes*.

BATHYTROCTES MICROLEPIS, GÜNTHER.

Bathytroctes microlepis, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 249; Challenger Report, XXII, 1887, 226, pl. LVII, fig. A.—ALCOCK, Ann. and Mag. Nat. Hist., 1889, 451.

The maxillary extends to below the posterior third of the orbit. Height of the body 5¼ in total length (without caudal), the head 3⅗. Bones of head thin (as in *Bathytroctes macrolepis*). Head rather compressed, moderately deep, its depth at the occiput being two-thirds of its length; its upper surface is concave, the width of the interorbital space being one-half of the longitudinal diameter of the eye. Eye very large, rather longer than deep, one-third of the length of the head, and considerably longer than snout. Infraorbital ring rather narrow, the broad maxillary separated from the orbit by a very narrow strip of bone. Snout somewhat wedge-shaped, with upper profile declivous, with jaws equal in front and with maxillary extending to posterior third of the orbit. Dentition feeble; all the teeth equally minute and uniserial; intermaxillary and maxillary toothed throughout; vomerine series transverse and straight, slightly interrupted in middle; palatine series nearly as long as vomerine. Branchiostegals slender, rod-shaped. Gills four, that of fourth arch being short and reduced to a horizontal series of laminæ, which is only one-third of the horizontal series of the outer branchial arch. Gill laminæ very short, especially on the convex portion of the arches; gill rakers long, lanceolate, closely set, 24+11 on the outer branchial arch.

Vent considerably nearer to root of caudal fin than to gill opening, whilst origin of the dorsal fin is somewhat nearer to latter. Dorsal fin longer than high, its anterior rays increasing in length to fifth or sixth ray. Origin of anal behind vertical from middle of dorsal fin. Caudal fin deeply emarginate. Pectoral inserted a short way above lower profile; it has a moderately broad base, is three-fifths of the length of the head, and does not extend to ventral. Ventrals close together, scarcely extending to vent, their root being midway between root of caudal and anterior margin of orbit.

Scales deciduous, cycloid, with numerous fine concentric and radiating striæ; there were probably 9 scales in a transverse series between the lateral line and the origin of the dorsal fin and between the lateral line and the ventral fin. Lateral line straight, running from the upper end of the gill opening along the middle of the tail, with rather narrow mucous apertures. Color, uniform black. (*Günther.*)

Radial formula: B. 7; D. 16; A. 17; V. 8; L. lat. ca. 70.

One specimen, 10 inches long, was taken by the *Challenger*, southeast of Cape St. Vincent (Station V), at a depth of 1,090 fathoms, and another by the *Investigator*, in the Andaman Sea, 500 fathoms.

BATHYTROCTES MELANOCEPHALUS, VAILLANT.

Bathytroctes melanocephalus, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 155, pl. XI, figs. 3a, 3b.

Height of body one-fifth of total length, its greatest thickness one-eighth. The length of the head is two-fifths of the total length; the anterior profile is somewhat oblique. The length of the snout is equal to one-third of the distance from its tip to the posterior edge of the operculum. The maxillary extends to a vertical slightly behind the posterior margin of the orbit. The intermaxillary teeth and those on the mandible are elongate, fine, conical, uniserial, separated from each other by spaces scarcely equal to their own thickness. The eye is very large; its diameter two-elevenths of the length of the head; interorbital space slightly less. In fresh condition the framework on the operculum, which is very delicate, is hidden in the soft integument, forming a curtain, far extended posteriorly. After having been in alcohol, a great number of radiating ribs, extending downward and backward on the operculum, are seen. Vent considerably in advance of the anal, and near the middle of the distance from the posterior edge of the operculum to the base of the caudal. Lateral line is in the median line of the body, except in its anterior part; the scales which compose it are more conspicuous than on the rest of the body—twice as large, that is to say, one of them corresponds ordinarily to two transverse rows—and there are about 64 of them in the total length of the lateral line. The dorsal is inserted above the interspace between the ventrals and the origin of the anal, the anal being shorter than the dorsal. Both anal and dorsal are low. Caudal emarginate. Pectoral and ventral short, the former with 13 rays.

The body is grayish green; head deep, blackish blue; fins brown; eye with gray blue iris and black pupil. Scales oval, those of the lateral line peculiar in form (fully described and figured by Vaillant).

Four specimens were obtained by the *Travailleur* in the middle eastern Atlantic; two from the coast of Morocco, from 2,200 to 2,500 meters; one from the coast of Soudan, 1,435 meters; one from the Banc D'Arguin, 1,670 meters. The type is 108 millimeters in length.

It would appear from the published descriptions that *B. melanocephalus* is well distinguished from *B. microlepis*, although both have been taken in the same region. The most salient diagnostic characters, as published, are included in the analytical key to the species on a preceding page.

BATHYTROCTES (TALISMANIA) HOMOPTERUS, (VAILLANT.)

Bathytroctes homopterus, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 158, pl. XII, fig. 1.

Body elongate; its height one-seventh of its total length; thickness one-thirteenth.

The length of the head is about one-third of the total length, and the snout one-third of the length of the head. The maxillary extends nearly to the vertical from the middle of the eye, and, like the intermaxillary, it is armed with conical teeth, not very closely set. Teeth on the mandible lancet-shaped, curved inward. Opercular apparatus membranous. Vent twice as far from the snout as from the root of the caudal. The dorsal and anal fins are nearly opposite and approximately equal in length (the type specimen was much mutilated, and an exact description has not been given); the origin of the dorsal is above the vent, and the length of its base is slightly greater than the greatest height of the body; the anal resembles it very closely and extends very slightly beyond it posteriorly. The pectoral fin appears to have been somewhat elongate, pointed, with its tip extending beyond the base of the ventral, which is situated almost in the middle of the length of the body. Scales moderate, 6 above and 14 below the lateral line.

Radial formula: D. 19; A. 19+; B. 9; L. lat. 64.

A single specimen was obtained by the French expedition at Station LXXXVII, from the Banc d'Arguin, at a depth of 1,113 meters. The type appears to have been very badly mutilated, but M. Vaillant has made a careful restoration in the figure which he presents.

This species, like *B. antillarum* and *B. australis*, belongs to a division of the genus distinguished by having the dorsal and anal, equal in length, and nearly opposite. For this group a subgenus is proposed under the name of *Talismania.*

BATHYTROCTES (TALISMANIA) ANTILLARUM, Goode and Bean, n. s. (Figure 49.)

The maxillary extends below the anterior portion of the orbit, and essentially to the vertical from the anterior margin of the pupil. The height of the body is contained 5 times in the total length (without caudal); the head 3½. Bones of the head thin; head compressed, moderately deep, its depth at the occiput being three-fifths of its length. The profile of the head in advance of the orbit is slightly concave, the upper margin of the orbit approaching very close to the upper profile; the supraorbital rim forming a portion of the dorsal profile of the head. The width of the interorbital space is nearly half the diameter of the eye. Eye large, conspicuous, its diameter equal to one-third of the length of the head; the pupil also large, its diameter two-fifths that of the orbit; its horizontal diameter considerably greater than the length of the snout, its vertical diameter equal to the length of the snout, which is contained 4 times in the length of the head. Interorbital ring very narrow: the maxillary is separated from the orbit by a very narrow strip of bone. Snout sharply conical, its upper profile concave, jaws equal in front. Dentition feeble; all the teeth equal, minute, uniserial. Intermaxillary and maxillary toothed throughout. Vomerine series transverse and straight, slightly interrupted in the middle; palatine series nearly as long as the vomerine; the two last-named series confluent. Branchiostegals 7; exceedingly slender and long. Gills 4; the fourth well developed, with a slit behind it. Gill laminæ short, especially on the convex portion of the arches. Gill rakers long, lanceolate, closely set; 17 on the outer branchial arch below the angle; 7 above. Vent equidistant between the root of the caudal and the gill opening; origin of the dorsal nearer to the latter. Dorsal fin longer than high, its anterior rays increasing in length from the eighth to the nineteenth ray. Origin of the anal somewhat in advance of the dorsal, which is inserted over the third ray at the point where it emerges from its scaly sheath. Caudal fin deeply emarginate. Pectoral fin inserted in the lower third of the height of the body; moderately broad at its base; its upper rays nearly twice as long as the lower ones; its length half that of the head, and its tip, when extended straight, in the vertical from the insertion of the ventral, which passes through the twelfth scale of the lateral line. Ventrals close together, not reaching to the vent, but to the origin of the sheath which incloses both the vent and the base of the anal fin: its length equal to that of the lower rays of the pectoral and to that of the snout. The root of the ventral midway between the tip of the snout and the root of the anterior caudal rays. Scales large, deciduous, cycloid; about 9 horizontal rows above the ventrals. Lateral line curving in a concave sweep from near the upper angle of the operculum to a point above the origin of the basal sheath of the anal, thence in a straight line to the base of the caudal. Color of the specimen (denuded of scales and long kept in alcohol), a rusty brown; head blackish.

Radial formula, B. 7; D. 20; A. 22; P. 13; V. 8. L. lat. 47.

A single specimen (No 43739, U. S. N. M.) was obtained by the *Albatross* at station 2394, lat. 28° 38′ 30″ N., lon. 87° 02′ W., at a depth of 420 fathoms.

BATHYTROCTES (TALISMANIA) ÆQUATORIS, Goode and Bean, n. s. (Figure 50.)

A species of *Bathytroctes* resembling *B. antillarum* in the size of the scales, but with a mouth larger than that in *B. homopterus.*

The maxillary reaches to the vertical from the posterior margin of the orbit. The height of the body is contained 5⅜ times in the total length; the length of the head 3⅛. Bones of the head thin; head large, compressed, the depth at the occiput being three-fourths its length, its width about one-third. Its upper surface longitudinal, concave, and deeply concave between the orbits, with a convexity above the snout. Width of the interorbital space about equal to the diameter of the eye. The length of the snout contained 3⅜ times in that of the head. Eye large, a little longer than deep, contained 4⅔ times in the length of the head and 1⅛ times in the length of the snout. Infraorbital ring very narrow. The maxillary is broad, large, and conspicuously dilated at the extremity, its greatest width at this point being more than two-thirds the diameter of the eye. Cleft of the mouth wide. Dentition feeble; no traces of teeth upon either vomer or palatine.[1] Branchiostegals 5, long and slender. Gills 4. Gill laminæ short, especially on the convex portion of the arches. Gill rakers long, strong, broad at the base; 6+17 on the outer arch.

Vent placed equidistant from root of caudal and root of pectoral. The origin of the dorsal over the vent; slightly in advance of that of the anal. Dorsal fin longer than high, its anterior rays increasing in length to the middle of the fin, the longest ray contained 3⅜ in length of head, and about equal to the longest ray of the anal. Caudal fin deeply emarginate. Pectoral inserted far below the middle of the body. It has a narrow base, and its length in a perfect specimen is probably not greater than the diameter of the eye. Ventrals close together, remote from the vent, the root being nearly midway between the root of the caudal and the tip of the snout, and equidistant from the root of the anal and the base of the pectoral.

Scales deciduous, cycloid, 45 or 48 in the lateral line, the lateral line beginning from a point on a level with the top of the eye, and ascending in a broad curve to a point over the ventrals, and thence in a straight line to the root of the caudal. Color, bluish black.

Radial formula: B. 5 (?); D. 22; A. 21; V. 7; P. 8.

A single specimen, 14½ inches in length, was obtained by the Fish Commission steamer *Albatross*, from station 2793, Lat. 01° 03′ N., lon. 80° 15′ W., in 741 fathoms.

BATHYTROCTES ATTRITUS, VAILLANT.

Bathytroctes attritus, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 1888, 158, pl. XII, fig. 2 (structural details).

This name was given by Vaillant to certain mutilated fishes obtained from the Azores, Cape Verde, and Banc d'Arguin, at 1,550 to 3,655 metres If they belong to *Bathytroctes* at all, they appear to resemble most closely *B. melanocephalus*. Until fresh material shall be obtained, it seems doubtful whether *B. attritus* is a valid species.

NARCETES, Alcock.

Narcetes, ALCOCK, Ann. and Mag. Nat. Hist., 1890, II, 305, VII, 1891, I, 10.

Body, as in *Bathytroctes*, rather elongate, compressed, covered with scales of moderate size. Eye rather small. Cleft of mouth wide, the maxillary extending beyond the vertical through the middle of the eye. Teeth in premaxillary and mandible fine, *pluriserial;* fine teeth on maxillary, palatines and vomer; no teeth on tongue. Dorsal and anal fins rather short, the former beginning in vertical from origin of ventral. No adipose dorsal. Caudal symmetrically forked. Gill openings wide. Pseudobranchiæ present. Gill rakers complete; 7 branchiostegals; 4 gills, with narrow laminæ. Gill rakers long. Pyloric appendages in moderate number.

The type of this genus is *Narcetes eremilas*, Alcock (l. c.), obtained by the *Investigator* in the Arabian Sea (station 105) at a depth of 740 fathoms. The description is based upon two female specimens, measuring 13½ and 9½ inches respectively.

PLATYTROCTES, Günther.

Platytroctes, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 249; Challenger Report, XXII, 229.

Body rather abbreviated, much compressed, and covered with small keeled scales. Mouth of moderate width; the maxillary and intermaxillary and mandible armed with a single series of small teeth. Palate smooth. Eye rather large. The dorsal and anal fins opposite to each other on the tail, moderately long. Adipose fin none. Caudal forked. Pectorals small. Ventrals none. The humeral arch terminates in the middle of the chest in a long, projecting, acute spine. Gill opening wide; six branchiostegals. Gills very narrow; pseudobranchiæ present; gill rakers lanceolate. Pyloric appendages rudimentary.

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[1] This may be due to the condition of the specimen. Should it be a good character it may necessitate the formation of another subgenus.

PLATYTROCTES APUS, GÜNTHER. (Figure 58).

Platytroctes apus, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 249; Challenger Report, XXII, 1887, 229, pl. LVIII, fig. A.—ALCOCK, Ann. and Mag. Nat. Hist., VI, 1890, II, 307.

Body much compressed and deep; its greatest depth at about the middle of its length, and contained in it 2¾ times, not including the caudal. Head compressed, moderate, two-sevenths of the length of the body, longitudinally concave above, the concavity bordered on each side by a perforated muciferous canal, and broadest behind, tapering to a point between the nostrils. Bones of head are rather thin, but less so than in *Bathytroctes*. Eye large, one-third of the length of the head, equal to snout, and situated close to upper profile. Infraorbital ring incomplete. Mouth rather small, the lower jaw projecting. Maxillary broad, short, extending to vertical from margin of orbit. Dentition very feeble; teeth uniserial, uniformly minute, occupying the whole extent of intermaxillary and the maxillary, but confined to the front part of the mandible; only a few rudimentary teeth are visible on the side of the mandible. Vomer with a minute tooth on each side; palatines toothless.

Branchiostegals extremely slender, curved. Gills four; the inner one very short; gill laminæ short, especially on the convex portion of the arches; gill rakers long, lanceolate, closely set, 20+10 on the outer branchial arch.[*]

Vent is much nearer to root of caudal than to gill opening. Dorsal fin commences immediately above it, the anal behind; these fins are very similar in shape and of moderate height. Caudal peduncle more than half as deep as long, its depth being increased by a fold of the integument between the vertical fins. Caudal rather short and forked. Pectoral very short, only half as long as the eye.

Scales small, cycloid, each with a longitudinal keel, and not spinigerous, as in *Macrurus*, but simple, as in the keeled scales of a snake; the striations, instead of continually crossing the scale, are interrupted by the raised median line. Head entirely scaleless. Lateral line straight, running along the middle of the body and tail, and composed of very small pores.

Brown; head, pectoral region, the vent, and fringes of the caudal peduncle black.

Radial formula: D. 18; A. 17; P. 20; L. lat. about 100.

[*] A single individual, 5½ inches long, was taken by the *Challenger* at station 107, in the middle Atlantic, at depth of 1,500 fathoms. Alcock records it from the Arabian sea, *Investigator* station 105, in 740 fathoms.

XENODERMICHTHYS, Günther.

Xenodermichthys, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 250; Challenger Report, XXII, 1887, 230.

Body rather elongate, compressed, without true scales. The skin is rather tough, finely wrinkled longitudinally, with numerous small nodules, regularly arranged, which possess the structure and probably the functions of luminous organs. Minute, rudimentary, scale-like productions are imbedded in the skin, especially on the trunk. Mouth very small, with feeble jaws and rudimentary teeth in the intermaxillary and mandible, and a few in the maxillary. Palate toothless. Dorsal and anal fins equal in length. Caudal forked. Gill opening wide, but not extending much above the level of the pectoral fins. Gills well developed; pseudobranchiæ. Gill rakers long.

XENODERMICHTHYS NODULOSUS, GÜNTHER. (Figure 57.)

Xenodermichthys nodulosus, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 250; Challenger Report, XXII, 230, pl. LVIII, fig. C.

Body compressed, elongate, resembling the Stomiatids; its depth nearly uniform between the head and vent, and contained 6½ times in the total length. Head longer than deep; its length 5⅓ in total. Snout short, obtuse, with parabolic anterior profile. Mouth small, with minute teeth on intermaxillary and anterior portion of mandible. Maxillary short, broad, very thin, reaching slightly beyond the vertical from the anterior margin of the orbit. Eye moderate, not entering into the upper profile; its diameter greater than the width of the interorbital space, and two-ninths the length of the head. Snout shorter than the diameter of the orbit. Vent midway between the root of the caudal and the pectoral. Dorsal and anal similar in form and equal in extent, the anal beginning slightly behind the vent, and the dorsal immediately above it. The bases of the posterior rays of the two fins opposite. The ultimate rays of these fins are the longest, the length of the rays gradually increasing from beginning to end. Caudal peduncle nearly twice as long as its own height. Caudal deeply forked, with filamentous lobes, preceded above and below by numerous rudimentary rays. Pectoral placed low, narrow, pointed; its length three-fifths that of the head. Ventrals narrow, reaching to vent; their length equal to half that of the head.

Skin tough, leathery, finely wrinkled, studded with small raised nodules, which extend upon the rays of all the fins except the caudal; much more numerous below than above the lateral line, which is very conspicuous, broad, straight, originating close behind the eye and extending along the middle of the body and tail to the base of the caudal rays.

Radial formula: D. 33; A. 33; P. 6; V. 5.

A single specimen, 8 inches in length, was taken by the *Challenger* at station CCXXXII, south of Yeddo, Japan, at a depth of 345 fathoms.

ALEPOSOMUS, Gill.

Aleposomus, GILL, American Naturalist, XVIII, 1884, 433.

Alepocephalids with body elongate, scaleless. The skin is thick, finely rugose, with a considerable number of small nodules upon the belly, and sometimes also upon the sides and the lower part of the head. Lateral line wanting. Mouth moderate, with minute teeth upon the mandible and premaxillary. Palatines, tongue, and pharyngeal bones probably toothless. Dorsal and anal fins opposite, similar in form and equal in length. Caudal probably forked. Vent behind the middle of the body. Gill openings wide.

There are two species in this genus: *A. Copei*, Gill, with large oval orbit, large mouth, high vertical fins, and with numerous nodules upon the sides, and *A. socialis* (Vaillant), with smaller eye, its outline projecting above the dorsal outline, smaller mouth, and nodules apparently concentrated on the lower parts of the head and the anterior portion of the belly.

ALEPOSOMUS COPEI, GILL. (Figure 51.)

Aleposomus Copei, GILL, American Naturalist, XVIII, 1884, 433.

Body compressed, its outlines sloping from head to middle of the caudal peduncle; its height 5½ in its length.

Length of the head 3⅔ in length of body. Snout short, declivous, its length half the horizontal diameter of the eye and about one-fifth that of head. Mandible scarcely extending beyond upper jaw. Maxillary extends to vertical from middle of orbit. Small teeth upon mandible and premaxillary. Eye very large; its diameter half the length of the head; its upper outline does not project above the dorsal profile, as in *A. socialis*. Gill opening large. Skin thick, slimy, no lateral line distinguishable. No scales present, but numerous tubercles upon the sides of the body. None are perceptible on the head. Vent midway between the origin of the ventral and the tip of the last dorsal ray. Dorsal origin equidistant from the gill opening and the base of the middle caudal rays; highest in its middle portion, rounding forward and behind. Anal inserted immediately under the dorsal; similar in shape and equal in extent. Caudal, though mutilated, was undoubtedly emarginate, and probably forked. Accessory rays, characteristic not only of *Aleposomus* but of *Xenodermichthys*, are not conspicuous. The pectoral is inserted very low down, close to the posterior angle of the preopercular flap, and appears to have been feeble; its diameter not much greater than half the diameter of the eye. The ventral origin is equidistant from the posterior margin of the eye and the base of the posterior dorsal ray; it is slender, and reaches nearly, if not quite, to the vent. Color, uniform blackish.

A single specimen (No. 33551, U. S. N. M.), 3¼ inches in length, was obtained by the *Albatross* at station 2099 in 37° 12′ 20″ N. lat., 69° 39′ W. lon., at a depth of 2,949 fathoms.

ALEPOSOMUS SOCIALIS, (VAILLANT), GOODE and BEAN. (Figure 58.)

Xenodermichthys socialis, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 162, pl. XIII, fig. 1.

Body compressed, with upper and lower outlines parallel for the greater portion of their length. Its length is nearly 6 times its height.

Head one-fourth of length of body. Snout very short, hardly one-fourth length of the head, while the mandible, which extends considerably beyond the upper jaw, is nearly half as long as head. The maxillary reaches nearly to the line of the center of the eye. Small teeth upon the mandible and premaxillary. The palatines, the tongue, and the pharyngeal bones are toothless. The eye is enormous, its diameter two-fifths of the length of the head. It protrudes above the profile, forming a protuberance noticeable either at the side or from below. Width of interorbital space scarcely one-sixth of the length of the head. Gill opening large, although the opercular slit does not reach very far up, its upper edge being attached to the body by a membrane.

In the fresh individual the skin was slimy, covered by a thick mucus, so that the lateral line can not be distinguished; is doubtless merged in the fold between the upper and lower muscular masses. No trace of scales. Vent situated behind middle of body.

The dorsal extends behind the caudal peduncle; it is not very high and is slightly raised posteriorly in relation to the dorsal outline. The anal resembles it precisely in size and shape; the caudal is deeply emarginate, and is preceded above and below by very distinct accessory rays, which occupy half of the distance between the dorsal and the anal. The paired fins are but little developed, short, and the pectorals have about 16 rays.

Color uniformly deep blackish, violet; the fins seem lighter on account of their translucency. There are traces of black spots upon the membrane of the anal, and also under the eye upon the cheek and the opercular flap, and these continue also upon the belly; these spots are more conspicuous in the specimen when it is preserved than when it is fresh. The iris is violet; pupil opaline. (*Vaillant.*)

This species was obtained in great abundance on the Banc d'Arguin, where 133 specimens were obtained in one haul, at a depth of 1,230 meters. It was also obtained in small numbers off the coast of Morocco from 717 to 1,350 meters, and on the coast of Soudan at 800 meters. Vaillant seems to be somewhat uncertain whether or not this form belongs to the genus *Xenodermichthys*, and remarks that, comparing it with the diagnosis of Dr. Günther, he can see nothing which absolutely rules it out. Assuredly, the skin presents no traces of rugosities nor of any growth which can be compared to scales even in a rudimentary condition. At all events, it can be readily distinguished from *Xenodermichthys nodulosus* of Günther, which has an arrangement of fins very different, and a much slighter development of the eye.

As Vaillant says, the great abundance in which this fish was taken in one haul of the deep-sea net would seem to indicate that it occurs in large schools in the depths of ocean.

Xenodermichthys Güntheri, ALCOCK, Ann. and Mag. Nat. Hist., 1892, II, 357, vol. XVIII, fig. 3, from *Investigator*, station 133, Indian Ocean, 678 fathoms, seems likely to belong to this genus.

LEPTODERMA, Vaillant.

Leptoderma, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 1888, 165.

Body elongate, gradually diminishing posteriorly until it becomes almost thread-like. Head moderate, but (in the only known species) with enormous eyes. Mouth small. Teeth upon premaxillaries and maxillaries. A distinct submaxillary. Dorsal and anal elongate, extended upon the caudal peduncle and ending slightly in advance of its extremity, the fins very much larger than the dorsal. Gill opening wide, though not very high. No scales.

The genus is closely allied to *Xenodermichthys*, but is easily distinguished from it by its general appearance, its smaller mouth, and by the great inequality in the extent of the dorsal and anal fins. The skin, entirely devoid of scales, adheres but slightly to the tissues which it covers.

LEPTODERMA MACROPS, VAILLANT. (Figure 56.)

Leptoderma macrops, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 165, pl XII, fig. 2.—ALCOCK, Ann. and Mag. Nat. Hist., 1892, II, 361.

Body elongate, its greatest height just behind the head being equal to one-fifteenth of its length, and its thickness at the same place in about the same proportion. It is slightly thinner about its middle, and posteriorly the compression is much more decided.

Head small but for enormous size of orbital spheres; its length one-fifth that of the body; snout is obtuse, short, its length, hardly three-elevenths of distance separating its extremity from posterior margin of opercular flap; mouth small, the maxillary not reaching nearly back to the line of the anterior margin of the orbit. Each premaxillary armed with a row of small conical teeth to the number of about four; maxillary toothless, the mandible armed with teeth like those on the premaxillary, slightly developed, scarcely visible except when strongly magnified; no teeth on the palatines. Iris is much developed, protruding; diameter of eye is three-eighths length of head. Gill openings wide and low. Ventral far forward, at a distance from snout equal to about three-eighths length of body; lateral line apparently lacking; the tegument is so delicate that it has been impossible to find a specimen in which it was not destroyed, since it adhered but slightly to the muscular tissues. Dorsal and anal very low, unequal in extent, the origin of the former opposite twenty-second ray of the latter, both terminating at about the same vertical and close to the caudal. All the rays are divided and articulated. Caudal but slightly developed; pectoral lanceolate; ventrals seemingly connate.

Color, black, velvety; iris, gray; pupil, opaline.

Radial formula: D. 48; A. 71; V. 5.

This species appears, like *Xenodermichthys*, to occur in large schools upon the Banc d'Arguin, 47 specimens having been taken in one haul at a depth of 1,495 meters. Others were obtained in the same locality at 2,330 meters, and also on the coast of Soudan at 1,100 meters, and the coast of Morocco at 1,163 to 1,235 meters. M. Vaillant complains that notwithstanding the abundance of specimens not one of them was in condition for description.

The *Investigator* obtained at station 134, in the Indian Ocean, 753 fathoms, a fish 8¾ inches long, identified by Alcock with this form.

ANOMALOPTERUS, Vaillant.

Anomalopterus, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 1888, 160.

Body oblong, short; head very large. Teeth upon premaxillaries, mandible, and palatines. Soft dorsal and anal upon the caudal peduncle, nearly equal in extent, the former preceded by a kind of adipose fold or cushion, occupying the entire length of the back in front of it. Gill opening broad and large. Skin naked.

In its deprivation of scales the genus resembles *Xenodermichthys* and *Leptoderma*, from which, however, it is distinguished by its general form and by the adipose ante-dorsal cushion, which occurs in no other genus.

ANOMALOPTERUS PINGUIS, VAILLANT. (Figure 54.)

Anomalopterus pinguis, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 1888, 160.

Head nearly half entire length of body; length of snout one-third that of the head. Mouth very wide, the maxillary extending beyond perpendicular from posterior margin of orbit. Upper jaw and mandible armed with small teeth; stronger teeth upon palatines; none upon the vomer (the small size of the individual examined renders it impossible to be absolutely sure of this fact). Eye surrounded by a cutaneous fold, which in a fresh specimen narrows it very much, so that it measures only about one-twentieth of the length of the head. (The size of the eye seems much greater, however, in a specimen preserved in spirits.) Gill opening wide; the operculum covered in life by a membranaceous tegument.

Skin naked. The lateral line begins at upper angle of gill opening, descending rapidly to median line, after which it falls to the base of the caudal.

Dorsal occupies four-fifths of the length of the back, beginning above the upper angle of the gill opening. Its anterior portion (two-thirds of its entire length) is composed of a low, cutaneous, adipose, fold or cushion, while its posterior portion is a true fin supported by rays. Anal extends to posterior portion of dorsal, though a little shorter and extending a little further posteriorly. Caudal slightly emarginate, and equal in length to about one-sixth of the length of the body. Pectorals very short; the origin almost under that of the rayed portion of the dorsal.

Color bluish; iris white.

Radial formula: D. 17; A. 14; P. 9; V. 9.

The unique representative of this species was obtained off the coast of Morocco, in 1,400 meters. It is very small, and the action of alcohol has distorted it very much. Happily a sketch made from the fresh specimen has enabled M. Vaillant to give a figure and a quite minute description. The length of the body is scarcely 60 millimeters; its height is about one-fifth of its length, and its thickness is still less.

AULASTOMATOMORPHA, Alcock.

Aulastomatomorpha, ALCOCK, Ann. and Mag. Nat. Hist., VI, 307, (Oct. 1890), VII, 10, Jan. 1891, with outline figure. Type, *A. phosphorops*.

Body elongate, covered with minute, hardly imbricate scales. Head naked. Anterior bones of head produced into a long tube terminating in a narrow mouth. Margin of upper jaw formed by premaxillaries and maxillaries. Teeth uniserial and in the jaws only. Eye large. Gill cover apparently complete. Gill opening wide below, contracted above, its upper angle nearly on the level of the pectoral fin. Gills 4, with narrow laminæ. Pseudobranchiæ rudimentary. Dorsal fin upon the caudal peduncle. No adipose dorsal. Anal fin very long. Caudal forked. Pyloric cæca few, small. No air bladder.

This genus is characterized especially by the rudimentary pseudobrânchiæ, and the prolongation of the anterior bones of the head into a snout, like that of *Aulostoma*.

The type of the species is *A. phosphorops*, Alcock (l. c.), obtained by the *Investigator* in the Arabian Sea, station 104, at a depth of 1,000 fathoms; a single specimen, believed to be an adult male, 11 inches in length. (Figure 55.) Alcock remarks that the head of this unique fish is covered throughout by a thick, spongy, glandular skin, with dazzling white reflections, which is probably luminous in function. The eyes are very large and extremely prominent.

Family PTEROTHRISSIDÆ, Goode and Bean.

Bathythrissidæ, GÜNTHER, Challenger Report, XXII, 1887, 220.

Body oblong, with rounded abdomen, covered with cycloid scales; head naked; barbels none. Margin of the upper jaw formed by the intermaxillaries mesially, and by the maxillaries laterally. Opercular apparatus complete. Adipose fin absent; dorsal fin much elongate, many-rayed; anal fin short. Stomach with blind sac; pyloric appendages numerous. Gill apparatus well developed; pseudobranchiæ; gill openings wide; an air bladder. Ova very small; ovaries without duct. (*Günther*.)

The name of the genus proposed by Günther falls into synonymy, and the family name is, in accordance with common usage, changed to correspond to that of the typical genus.

PTEROTHRISSUS, Hilgendorf.

Pterothrissus, HILGENDORF, Act. Soc. Leopoldina Carol., XIII, Nos. 15, 16, September 3, 1877, 127.—Sitzungsber. Naturf. Freunde, 1878, 156; 1887, 187.
Bathythrissa, GÜNTHER, Ann. and Mag. Nat. Hist., XX, 1877 (November 1), 433.—Challenger Report, XXII, 220.

"Body covered with scales of moderate size; head narrow, oblong, with muciferous channels much developed. Eye large. Mouth narrow, coregonoid, with bands of minute teeth embedded in the thick lips; maxillary with a marginal row of very small teeth. Caudal fin forked, with a dense layer of small scales. Air bladder with very thick walls, terminating in two short horns in front, pointed behind." (*Günther.*)

Pterothrissus was published September 3, 1877, and *Bathythrissa*, November 1, 1877. (See *Sitzungsberichte, Naturforschende Freunde*, 1887, No. 9, 187, 188.)

The genus and family are known only from a single species, *P. gissu*, Hilgendorf (Figure 52) [=*Bathythrissa dorsalis*, Günther, Challenger Report, XXII, 222, pl. LVI, fig. A], from Japan taken in 345 (?) fathoms.

Family ARGENTINIDÆ.

Argentininæ, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 288.
Argentinidæ, GILL, Smithsonian Report, 1884, 619. JORDAN, Cat. Fish. N. A., 1885, 42.

Body elongate; scales cycloid. Head naked. Mouth terminal, small or moderate; the maxillary forming the lateral margin of the upper jaw; a supplemental maxillary bone; premaxillaries not protractile. Teeth in jaws absent. Four gills, a slit behind the last. Pseudobranchiæ present. Gill membranes separate, free from the isthmus. Branchiostegals six or more. Dorsal short, nearly median; adipose fin present. Caudal fin forked. Anal fin moderate. Ventrals under the dorsal, nearly median, of moderate length, rays 9 to 14. Pectorals placed low. A lateral line. Air bladder large. Stomach cæcal. Pyloric cæca few or none.

ARGENTINA, Artedi.

Argentina, ARTEDI, Genera Piscium, 8.—CUVIER, Règne Animal, 2d ed., 1829, II, 308.—GILL, Proc. Acad. Nat. Sci. Phila., 1862, 15.—GÜNTHER, Cat. Fish. Brit. Mus., VI, 202.

Body fusiform, with mouth small; maxillaries and intermaxillaries short, the upper jaw not reaching to vertical from anterior margin of orbit. Jaws toothless. Minute teeth on head of vomer and on palatines in front. Tongue toothed. Ventrals behind dorsal. Caudal furcate. Branchiostegals well developed, 6–8. Pyloric cæca present in moderate numbers. Scales rather large.

KEY TO THE SPECIES OF ARGENTINA.

A. Scales spinigerous.
  1. Body low (height 8 in total). Diameter of eye less than or equal to snout.........A. SPHYRÆNA
  2. Body high (5 to 5¼ in height). Diameter of eye greater than length of snout............A. SILUS
B. Scales smooth.
  1. Body low.
    A. Diameter of eye greater than length of snout; height of body 7 in total..........A. STRIATA
    B. Diameter of eye less than length of snout; height of body 8 in total............A. ELONGATA

ARGENTINA SPHYRÆNA, LINNÆUS.

Sphyræna parva, RONDELETIUS, Libri de Piscibus Marinis, 1554, I. 227.—GESNER, Fischbuch, 1558, 883, 1061.
Argentina, WILLUGHBY, 1686.—RAY, 1713.—ARTEDI, 1738.
Argentina sphyræna, LINNÆUS, Syst. Nat., ed., XII, 1766, I, 513.—RISSO, Ichth. Nice, 336.—NILSSON, Skand Faun., Fisk., 476.—GÜNTHER, Cat. Fish. Brit. Mus., VI, 203; Challenger Report, XXII, 218.—CANESTRINI, Fauna d'Italia, Pesci, 129.—COLLETT, Norges Fiske, 171; Forhandl. Vid. Selsk. Christ., 1880, 92.—GIGLIOLI, Elenco, 102.
Goniosoma argentinum, COSTA, Fauna Napolitana, pl. XXXVI.
Osmerus hebridicus, YARRELL, Brit. Fish., 2d ed., II, 133.

Argentina hebridica, Nilsson, *op. cit.*, 474.—Capello, Peix. Portugal, 35.
Argentina Cuvieri, Cuvier and Valenciennes, Hist. Nat. Poiss., xxi, 418.
Argentina Yarrellii, Cuvier and Valenciennes, *lo. c.*, xxi, 418,
Argentina lioglossa, Cuvier and Valenciennes, *lo. c.*
Argentina decagon, Clarke, Trans. New Zealand Inst., xi, 1879, 295.

Height of body one-eighth of its entire length, with head 4 to 4½ in same; eye 3 in head, and less than or equal to the length of the snout. Ventrals nearly median and under dorsal. Scales minutely spinigerous, almost smooth in young. Head scaleless, diaphanous.

Radial formula: D. 10–12; A. 12; P. 14; V. 11; L. lat. 52.

This form is abundant in shallow water in the Mediterranean and Adriatic, where it is often taken by the fishermen. It is known also off Portugal and in the northeastern Atlantic from Scotland to 61° and beyond. In Norwegian waters it occurs in the depths, Collett having obtained it in 200 fathoms. This distribution is paradoxical, and is referred to in another place.

A. sphyræna spawns in April in the Mediterranean.

Günther considers *A. decagon* from Hokitika, New Zealand, to be the same form. Giglioli, after studying an extensive series obtained by him at Messina, has decided that *A. lioglossa*, C. & V., is also identical with *A. sphyræna*.

ARGENTINA SILUS,(Ascanius),Nilsson. (Figure 61.)

Salmo silus, Ascanius, Icon. Rer. Nat., 1763, pars iii, 3, tab. xxiv.
Coregonus silus, Cuvier, Règne Animal, 2d. ed., 1829, ii, 308.
Argentina silus, Nilsson, Observationes Ichthyologicæ, Lund, 1835, 1-7.—Cuvier and Valenciennes, Hist. Nat. Poiss., xxi, 421.—Nilsson, Skand. Faun., Fisk., 469.—Günther, Cat. Fish. Brit. Mus., vi, 203.—Challenger Report, xxii, 217.—Collett, Norges Fiske, 173; Nyt Mag. f. Naturvid., xviii, 109.
Acantholepis silus, Kröyer, Danmark's Fiske, iii, 98.—Gaimard, Voy. Skand., Poiss., pl. xvii.
Silus Ascanii, Reinhardt, Bemärk. ti. Skand. Ichthyol., 11.
Argentina syrtensium, Goode and Bean, Proc. U. S. Nat. Mus., i, 1875, 261.

Height of body 5½ in its total length, with head 4 to 4¼ in same. Eye, 3 in head and longer than snout. Ventrals median, and under dorsal. Scales strongly spinigerous.

Radial formula: D. 11; A. 14; P. 17; V. 12. Scales, 3½, 66, 4. (A full description with measurements given by Goode and Bean, *loc. cit.*)

This form occurs in Norway at depths of 100 fathoms and less. The first taken in North America—the type of *A. syrtensium*, Goode and Bean (U. S. N. M., No. 21624)—was found in the stomach of a *Phycis* from Sable Island Bank, in 200 fathoms. In July, 1891, a specimen 18 inches long (U. S. N. M., No. 43708) was caught by a boy with a hook and line in the harbor of Belfast, Me. Another, No. 37801, 15 inches long, was taken at Biddeford Pool, Maine. This distribution is even more puzzling than that of *A. sphyræna*.

ARGENTINA STRIATA, Goode and Bean, n. s. (Figure 62.)

The height of the body is contained 7 times in its total length; the length of the head 3 times in total length. The eye is contained 2½ times in the length of the head, and is longer than the conical snout. Ventrals nearly median; their insertion under the penultimate dorsal rays. Scales in the lateral line obliquely striate. Tongue with teeth. Origin of the dorsal equidistant between snout and root of caudal. There appears to have been a silvery, longitudinal band under the lateral line.

Radial formula: D. 10; A. 11; P. 17; V. 14.

The specimens studied were denuded of scales, but the impressions indicate that there were 51 in the lateral line, 4 above and 4 below. The specimens (No. 43858, U. S. N. M.) were obtained by the *Albatross* from station 2402 in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms.

Argentina elongata, Hutton (Annals and Magazine of Natural History, iii, 1879, 53.—Voy. Challenger, xxii, 218), was obtained at Port Campbell, New Zealand.

Family MICROSTOMIDÆ.

Microstomatoidæ, GILL, Cat. Fish. E. Coast, N. A., 1861, 54.
Microstomidæ, GILL, Arr. Fam. Fishes, 1872, 16.

The family *Microstomidæ*, although never formally defined by Dr. Gill, is evidently a valid one, separated from *Argentinidæ* by the much smaller number of branchiostegal rays, only three or four, instead of six to eight, as in *Argentinidæ*. The advanced position of the ventrals is a collateral character.

MICROSTOMA, Cuvier.

Microstoma, CUVIER, Règne Animal, 1st ed., 1817, II, 184; 1829, II, 285.—GÜNTHER, Cat. Fish. Brit. Mus., VI, 204; Challenger Report, XXII, 218.

Microstomids, with small mouth, small intermaxillaries, short and broad maxillaries. Small teeth, in narrow series in lower jaw, and on head of vomer. Ventrals in front of dorsal. Caudal fin furcate, its base squamose. Branchiostegals, 3–4. Pyloric cæca absent. Air bladder large. Scales large, thin, silvery. Adipose fin absent in adults.

"The evidence as to the bathybial habits of these small fishes," writes Günther, "is merely circumstantial. They seem to have the same vertical range as *Argentina*, but are more rarely seen in collections, as the small size of their slender cylindrical body renders their capture very difficult."

MICROSTOMA ROTUNDATUM, (RISSO), GÜNTHER. (Figure 59.)

Gasteropelecus microstoma, RISSO, Ichth. Nice, 1810, 356.
Microstoma microstoma, CUVIER, Régne Animal, ed. 1, 1817, II, 184; ed. 2, 1829, 285.
Microstoma rotundata, RISSO, Eur. Mérid., 1827, III, 475, fig. xxxvi.
Microstoma rotundatum, GÜNTHER, Cat. Fish. Brit. Mus., VI, 201.—CANESTRINI, *op. cit.*, 130.
Microstoma argenteum, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XVIII, 358, pl. 544.

Body cylindrical, mouth small. Height of body 10 to 11 in length. Diameter of eye 2½ in length of head, the latter 5½ in total length. Ventrals midway from base of caudal and base of pectoral. Adipose fin usually wanting. Silvery.

Radial formula: D. 9–11; A. 8; P. 8; V. 10; L. lat. 52.

Known only from Nice and Sicily. It is placed among bathybial forms in deference to the opinion of Dr. Günther already quoted. The National Museum has a specimen (No. 40072) from Messina, sent by the Florence Museum, one of fifteen examples of this very rare form, taken by Giglioli, September 25–28, 1875.

We have had no opportunity of examining another Mediterranean form recently described by Facciolá (*Microstoma oblitum*, Facciolá, Naturalista Siciliana VI, 193.)

MICROSTOMA GRŒNLANDICUM, REINHARDT.

Microstomus grœnlandicus, REINHARDT, Vid. Selsk. Naturvid. og Math. Afhandl., VIII, 1841, lxxiv.
Microstoma grœnlandicum, GÜNTHER, Cat. Fish. Brit. Mus., VI, 205.—GILL, Cat. Fish. E. C. N. Amer.

"Height of body 10 in length. Length of head 5 in same. Ventrals under posterior part of ventrals. Adipose fin conspicuous."

Radial formula: D. 11; A. 10; V. 10.

This form was found at an early day in the waters of Greenland, but has not since been observed.

Family BATHYLAGIDÆ.

Bathylagidæ, GILL, Science, III, 620, 1884. (Name only.)

The family *Bathylagidæ* of Gill was formed for the genus *Bathylagus* of Günther. This genus includes five species of small fishes, one of them (*B. atlanticus*) occurring in the Atlantic in depths as great as 2,040 fathoms, another (*B. antarcticus*) inhabiting the Antarctic Ocean at a depth of 1,950 fathoms, and a third (*B. pacificus*) occurring off the coast of Washington in 685 to 877 fathoms. All of these species were apparently black in life. In all of them the eye is large and is believed to be intended for the utilization of phosphorescent light produced by other animals of the deep sea. These fishes are not predaceous. Their bones are very thin, the fin rays feeble, and the scales easily deciduous. Dr. Günther considers *Bathylagus* nearly allied to *Microstoma*.

Mr. Murray has made a very important observation on the circumstances attending the capture of this fish, which has direct bearing on the question as to the bathybial range of many of the fishes captured by the deep-sea trawl. At this station the trawl was over the side seven hours, but it never seemed to touch the bottom. Yet it contained, besides the specimen of *Bathylagus*, several large Medusæ, several bright scarlet shrimps, and other animals. "It is impossible to say how near the trawl may have been to the bottom, but Mr. Murray considers it quite certain that most, if not all, of the animals above mentioned were captured in the intermediate water, between a depth of 100 fathoms from the surface and a short distance from the bottom."

"Notwithstanding this circumstance," says Günther, "the thinness of the bones, the fragility of the fin rays, the delicacy of the skin and scales, and the enormously large eyes, seem to be sufficient evidence that these fishes are actually inhabitants of very great depths, although there may be reasonable doubts as regards the exact depth at which *Bathylagus atlanticus* was obtained. These fishes must therefore be entirely dependent for vision on the phosphorescent light which is produced by other abyssal creatures. Not being fish of prey themselves, or only to a slight degree, they would be attracted by the light issuing from the Pediculates and Stomiatids of the deep, and thus fall an easy prey to these fishes."

BATHYLAGUS, Günther.

Bathylagus, Günther, Ann. and Mag. Nat. Hist., 1878, 5th series, II, 248; Challenger Report, XXII, 219.

Body oblong, compressed, covered with thin deciduous scales of moderate size. No phosphorescent organs. Head short, rather compressed, with thin membranaceous bones. Mouth very narrow, transverse, anterior; the margin of the upper jaw is formed by the intermaxillary and maxillary, which is short dilated. Teeth on the intermaxillary rudimentary; those of the lower jaw extremely small, implanted on the edge of the bone, forming a minute serrature; a series of minute teeth across the vomer and along the palatine. Eye very large. Pectoral and ventral fins developed; the latter seven-rayed and inserted opposite to the dorsal, at a considerable distance from the pectoral. Dorsal fin in the middle of the length of the body; adispose fin small, not very far from the caudal. Anal fin of moderate length or many-rayed. Gill opening narrowed, commencing opposite to the root of the pectoral, and extending across the isthmus, the gill membranes being united and not attached to the isthmus. Gill rakers lanceolate, rather long; gills small; pseudobranchiæ well developed.

KEY TO THE SPECIES OF BATHYLAGUS.

I. Anal fin short, with 13 to 19 rays, D. 9.
A. Dorsal equidistant from snout and caudal, 13 anal rays.....................Bathylagus atlanticus
B. Dorsal nearer to snout than caudal.
1. Length of head one-fourth of total, V. 7; A. 16 ....Bathylagus euryops
2. Length of head two-ninths of total, V. 9; A. 19 ....Bathylagus Benedicti
II. Anal fin moderate, 22 or more rays, D. 10.
A. Length of head two-ninths of total, body slender, A. 22; V. 8............Bathylagus antarcticus

BATHYLAGUS ATLANTICUS, Günther.

Bathylagus atlanticus, Günther, Ann. and Mag. Nat. Hist., 1878, II, 248; Challenger Report, XXII, 1887, 219.

The height of the body is a little less than the length of the head, which is one-fourth of the total (without caudal); the eye one half of the length of the head. The width of the interorbital space is only two-thirds of that of the eye. Snout very short, with steep anterior profile and transverse anterior mouth, the cleft of the mouth being nearly on the same level as the lower margin of the eye. All the bones of the head are very thin, semicartilaginous; the head seems to have been scaleless. The gill cavity is closed behind, the gill opening beginning opposite to the root of the pectoral fin, and the gill membrane forming a broad bridge across the isthmus. This membranous bridge is not attached to the isthmus and contains a layer of transverse muscular fascicles, by which the gill covers can be simultaneously firmly closed. The branchiostegals are extremely thin and short and hidden in the membrane. The dorsal fin commences nearly midway between the snout and caudal; it is short and composed of feeble rays. Vent placed far backwards, the length of the tail not being much more than that of the head. Anal fin likewise composed of feeble rays, terminating at a short distance from the caudal. The caudal fin is too much injured to ascertain its shape. Pectoral fin narrow, close to the lower profile. Ventrals opposite to the hind part of the dorsal fin.

All the scales being lost, their size and number can be given only approximately from the remaining scale pouches; they must have been very thin, and the lateral line seems to have run along the middle of the side of the body. Of the color nothing can be stated, except that the scale pouches have a distinct black margin. (*Günther.*)

Radial formula: B. 3; D. 9; A. 13; P. 7; V. 8; L. lat. 40.

One specimen, in very bad condition and 6½ inches long, was obtained by the *Challenger* in the South Atlantic, at station 318 (depth, 2,040 fathoms).

The allied form, *Bathylagus antarcticus*, Günther (Ann. and Mag. Nat. Hist., 1878, II, 248; Challenger Report, XXII, 220), was obtained in the Antarctic Ocean by the *Challenger*, at a depth of 1,950 fathoms.

BATHYLAGUS EURYOPS, GOODE and BEAN, n. s. (Figure 63.)

Height of the body considerably less than the length of the head (equal to length of the head without snout), the length of the head being one-fourth of the total (without caudal). The diameter of the eye is one-half the length of the head; width of the interorbital space a little more than one-half the diameter of the eye. Snout very short; steep profile; its angle on a level with the lower margin of the eye. All the bones of the head very thin, semicartilaginous. Gill apparatus as in the other species. Dorsal fin feeble, nearer tip of snout than root of caudal. The vent far back, the length of the tail not being much more than that of the head. Anal fin feeble, distance of its insertion from the end of the base of the dorsal being greater than the length of the head.

Radial formula: D. 19; A. 16; B. 7; P. 9.

Several specimens were obtained by the *Albatross:* one (No. 35420, U. S. N. M.) in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms; another (No. 31861, U. S. N. M.) in 39° 52′ N. lat., 70° 30′ W. lon., at a depth of about 600 fathoms; a third (No. 39477, U. S. N. M.), a small individual, 4 inches in length, in bad condition, which appears to belong to this species, taken at station 2571 in 40° 09′ 30″ N. lat., 67° 00′ W. lon., at a depth of 1356 fathoms.

BATHYLAGUS BENEDICTI, GOODE and BEAN, n. s. (Figure 64.)

This species is in some respects intermediate between *B. atlanticus* and *B. antarcticus.* The height of the body is nearly equal to the length of the head, which is two-ninths of the total (without caudal). The diameter of the eye is one-half the length of the head, as in the other species. The width of the interorbital space is less than two-thirds of that of the eye (proportionately narrower than in the other species). Snout very short, its length about one-fourth the diameter of the eye. Mouth short, its angle being about on a level with the lower margin of the eye. Bones of head thin, semicartilaginous; head apparently scaleless; no traces of scales in the specimens before us. Gill cavity, membranes, and branchiostegals as in the other species. The origin of the dorsal fin is nearer to the end of the snout than to the base of the caudal, and equidistant between the snout and the adipose fin; its length equal to two-fifths of the length of the head. Vent placed farther forward than in *B. atlanticus*, the length of the postanal portion of the body being greater than that of the head, and contained 3½ times in the total without caudal. The ventral fins are placed opposite the posterior portion of the base of the dorsal.

Although the scales have all disappeared, it would seem that there had been about 32 longitudinal rows; and their size may be judged of by the fact that there were 7 rows between the base of the pectoral and the vertical from the origin of the ventral. Adipose fin slender and long, its length equal to one-half of the diameter of the eye.

Radial formula: D. 9; A. 19; V. 9; P. 10.

Several specimens have been obtained by the Fish Commission steamer *Albatross*: One (No. 33510, U. S. N. M.), 5⅝ inches in length, from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1022 fathoms; another, 5¾ inches in length, from station 2711, in 38° 59′ N. lat., 70° 07′ W. lon., at a depth of 1344 fathoms; a third specimen (No. 39480, U. S. N. M.), about 4½ inches in length, from station 2572, in 40° 29′ N. lat., 66° 04′ W. lon., at a depth of 1769 fathoms.

This species is named in honor of Mr. J. H. Benedict, of the U. S. National Museum, for several years the resident naturalist of the *Albatross*.

Family SYNODONTIDÆ.

Synodontidæ, GILL, Arr. Fam. Fishes, 1872, 16.—JORDAN, Cat. Fish. N. A., 1885, 39.

Body elongate, subcylindrical, or somewhat compressed, covered with cycloid or ctenoid scales. Mouth wide, the entire margins of the upper jaw formed by the slender elongate premaxillaries, to which are adherent the slender maxillaries, which are sometimes rudimentary or absent. Teeth in jaws usually in cardiform bands, with larger teeth, usually depressible, among them; teeth usually also on palatines and on tongue (absent in *Bathysynodus*, and in some of the species of *Chlorophthalmus*). No barbels. Gill membranes separate, free. Adipose fin present (except sometimes in *Bathysaurus*). Dorsal fin short, of soft rays. Anal moderate. Pectorals and ventrals present. Caudal forked. A tendency to erratic development in the fin rays. Air bladder small or absent. No photophores.

KEY TO THE GENERA OF SYNODONTIDÆ.

I. Maxillary narrow behind. Body subcylindrical, rather elongate. Mouth very wide. Dorsal median.
A. Snout conical; teeth not barbed.
1. Tongue with teeth. Ventrals close behind pectorals. Dorsals with 13 rays or less.
a. Palatine teeth in single band on each side.......................................SYNODUS
b. Palatine teeth in double bands..[SAURIDA]
2. Tongue toothless. Ventrals far behind pectorals. Dorsal with 20 rays..............BATHYLACO
B. Snout broad, depressed. Teeth barbed; fang-like.
1. Tongue toothed. Ventrals close to pectorals. Dorsal with 18 rays ....BATHYSAURUS
II. Maxillary rudimentary or absent. Body elongate, rather compressed. Mouth extremely wide.
A. Snout short. Head thick. Teeth cardiform, unequal, the largest in the lower jaw barbed.
1. Tongue small, with teeth. Pectoral small, very high. Ventrals very far from pectoral. HARPODON

SYNODUS, (Gronov.), Scopoli.

Synodus, GRONOV. SCOPOLI, Int. Nat. Hist., 1777, 246.— SCHNEIDER, Bloch's Syst. Ichth., 1801, 396 (type, *Esox synodus*, Gron.).—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 279.

Saurus, CUVIER, Règne Animal, 1st ed., 1817, 169; 2d ed., II, 313 (type, *Salmo saurus*, L.).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 457.—GÜNTHER, Cat. Fish. Brit. Mus., V, 394.

Body elongate, subcylindrical. Head depressed, the snout triangular, rather pointed. Interorbital region transversely concave. Mouth very wide; premaxillary not protractile, long and strong, more than half length of the head; maxillary closely connected with it, very small or obsolete. Premaxillary with one or two series of large compressed knife-shaped teeth, the inner and larger depressible. Palatine teeth similar, smaller, in a single broad band. Lower jaw with a band of rather large teeth, the inner and larger teeth depressible; a patch of strong, depressible teeth on the tongue in front, and a long row along the hyoid bone. Jaws nearly equal. Eye rather large, anterior. Supraorbital forming a projection above the eye. Pseudobranchiæ well developed. Gill rakers very small, spine-like. Gill membranes slightly connected. Top of head naked. Cheeks and opercles scaled like the body. Body covered with rather small, adherent, cycloid scales. Lateral line present. No phosphorescent spots. Dorsal fin short, rather anterior. Pectorals moderate, inserted high. Ventrals anterior, not far behind pectorals, large, the inner rays longer than the outer. Anal short. Caudal narrow, forked. Branchiostegals 12 to 16. Stomach with a long, blind sac and many pyloric cæca. (*Jordan.*)

The genus has the appearance of being well suited for deep-water life, and its near allies are some of the most characteristic of the bathybial forms.

SYNODUS SAURUS (LINNÆUS.).

Salmo saurus, LINNÆUS, Syst. Nat., ed. x, 1758, I, 310.
Saurus saurus, CUVIER, Règne Animal, 1st ed. II, 1817, 169; 2d ed. 1829, II, 313.
Saurus lacerta, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 463.
Synodus lacerta, GOODE, Fishes of the Bermudas, 68.
Saurus griseus, LOWE, Trans. Zoöl. Soc. London, II, 188.—GÜNTHER, Cat. Fish. Brit. Mus., V, 395.
Saurus trivirgatus, VALENCIENNES, Poiss., Isles Canaries, 72, pl. XV, fig. 1 (good).

Length of head 4 in total, snout broader than long, pointed, with jaws equal anteriorly, or with the upper jaw slightly projecting. Dorsal slightly higher than the length of its rear base. Pectorals extend to ninth or tenth scale of lateral line. Scales upon the tail slightly carinate. Color dusky gray above, yellow below. D. 11-12; A. 11-12. Scales 3½ | 58-62 | 6.

This form, the type of the genus *Saurus*, C. and V., is closely allied to "*Esox synodus*," Linn., the type of *Synodus*, Schn., which is quite as likely to have been the common American *Synodus fœtens* as any other form.

This form, rare in the Mediterranean, occurs also about St. Vincent, Madeira, and the Canaries, and has been taken by the authors at Bermuda, where it is known as the "Snake Fish." It occurs at moderate depths about Bermuda, but probably below the hundred-fathom line. No observations have been made in regard to its bathic range. *S. kaianus*, Günther, occurs about the Ki Islands at 140 fathoms; and Günther is of the opinion that *S. atlanticus*, Johnson, a Madeiran form, and *S. intermedius*, Spix, from tropical American waters, also range into deep water. Others are likely to do so. So is *Saurida*, an Indo-Pacific genus.

BATHYLACO, Goode and Bean, n. g.

Body subcylindrical, rather elongate, stout, similar in form to *Synodus*. (Scales are absent in the specimen studied, and it is not even possible to determine whether or not this is a naked species.) Head conical. Snout short. Mouth very large, wide, oblique, lower jaw slightly projecting. Maxillary narrow and long, with small teeth, which are somewhat biserial in front, and uniserial behind; interrupted at the symphysis. Mandible with a narrow band of similar teeth. Palatine teeth in a narrow band; tongue toothless. Eye moderately large, very far forward, its upper edge close to the dorsal profile. Pectoral small, placed low. Ventral nearly median, a little in advance of the dorsal and far behind the pectoral, with 8 rays. Dorsal origin nearly in the middle of the length and extending to above the middle of the anal. Adipose fin probably absent. The anal origin far back, fin short. Gill opening very wide, as in *Bathysaurus*, the left membrane overlapping the right, not attached to the isthmus. Branchiostegals numerous. Gill rakers short and few. Opercular bones very thin and feeble.

BATHYLACO NIGRICANS, GOODE and BEAN, n. s. (Figure 69.)

The length of the head one-fourth of total (without caudal); its depth one-half its length. Snout scarcely more than one-half the diameter of the eye, and contained about 8 times in the length of the head. The lower jaw the longer. The eye is contained 4½ times in the length of the head, its diameter equal to the width of the interorbital space. The intermaxillary is nearly two-thirds the length of the head. The mandible is contained 3 times in the distance from the tip of the snout to the origin of the dorsal. Dorsal fin inserted at a distance from the tip of the snout equal to twice the length of the head, the length of its base nearly one-third of total (without caudal). The anal origin is under the posterior third of the dorsal, the length of its base equal to half that of the head. Pectoral small, placed low, immediately back of the branchial opening; apparently few-rayed. Color, black.

Radial formula: B. 8; D. 20; A. 10; V. 8; P. 6.

The condition of the specimen is very bad, and it is only the desire to call attention to this interesting form that induces us to give it a name.

A single specimen, 8½ inches in length, was taken by the *Blake* off Santa Cruz, at a depth of 2,393 fathoms.

BATHYSAURUS, Günther.

Bathysaurus, GÜNTHER, Ann. and Mag. Nat. Hist., August, 1878, 181; Challenger Report, XXII, 181.

Shape of the body similar to that of *Saurus*, subcylindrical, elongate, covered with small scales. Head depressed, with the snout produced, flat above. Cleft of the mouth rather wide, with the lower jaw projecting; intermaxillary very long, styliform, tapering, not movable. Teeth in the jaws in broad bands, not covered by lips, curved, unequal in size, and barbed at the end. A series of similar teeth runs along the whole length of each side of the palate, a few teeth on the tongue, and groups of small ones on the hyoid. Eye of moderate size, lateral. Pectorals of moderate length. Ventral 8-rayed, inserted immediately behind the pectoral. Dorsal fin in the middle of the length of the body, with about 18 rays. Adipose fin absent or present. Anal of moderate length. Caudal emarginate. Gill openings very wide, the gill membranes being separate from each other and from the isthmus. Eleven or twelve branchiostegals. Gill laminæ well developed, separate; gill rakers tubercular; pseudobranchiæ well developed. (*Günther.*)

BATHYSAURUS FEROX, Günther. (Figures 65, 66.)

Bathysaurus ferox, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, 5th series, II, p. 182.—Challenger Expedition, XXII, p. 181, pl. XLVI, fig. A.

Bathysaurus Agassizii, GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, No. 5, 215.—JORDAN, Cat. Fishes N. America, 1885, 40.

Body very elongate, subcylindrical, with depressed head and tapering tail, its greatest height contained 7 times in its length, without caudal, and 8 times in the length to tip of upper caudal lobe; its greatest width 9 times in standard length; its height at origin of anal about half its greatest height; length of caudal peduncle equal to greatest height of body.

Scales irregularly ovate, with the free portion convex, thin, cycloid, leathery, deciduous; those in middle of body with a vertical diameter nearly equal to that of the pupil; those of lateral line with posterior margin truncate. In the lateral line, which extends upon the caudal fin, descending below the median line of the body near the origin of this fin, are 78 specialized scales, larger than those of the body. Between the dorsal fin and the lateral line are about 8 rows of scales; between the latter and the anal fin are about the same number.

Head twice as long as the greatest height of the body, strongly depressed, alligator-like, naked except upon the cheeks and a small area on the occiput, with strong nasal and interorbital ridges. The greatest width is somewhat more than half its greatest length, the width of interorbital area nearly equal to one-fourth the length of the lower jaw. The length of the snout is equal to twice the horizontal diameter of the eye. The anterior nostrils are situated midway between the tip of the snout and the anterior margin of the orbit. The cleft of the mouth is enormous, its angle posterior to the eye by a distance about equal to the width of the interorbital space. The length of the upper jaw equals one-sixth of the standard body length; that of the lower jaw, one fifth. The margin of the upper jaw (formed by the intermaxillary only) is armed with two irregular rows of depressible teeth, some of which are barbed; those in the inner row are much the largest, many of them being two-thirds as long as the horizontal diameter of the pupil and twice as long as those in the outer series. The lower jaws are enormously strong, and broad, flattened below, the width measured on the under surface of the head equal to two-thirds the width of the broad interorbital space The lower jaw projects outside of the upper jaw at the sides a distance apparently equal to half its width, and considerably in front; the lower jaws are thickly studded with depressible teeth, many of them, especially the larger inner ones, strongly barbed, those in front claw-like, recurved. On the palatines, three rows of teeth, the middle ones very much enlarged and most of them strongly barbed—these being the largest of all the teeth. On the tongue a few weaker teeth, and groups of similar teeth upon the vomer. Gill laminæ, gill rakers, and pseudobranchiæ as described by Dr. Günther.

The dorsal fin contains 17 rays, and is inserted at a distance from the tip of the snout equal to the length of its own base, and slightly greater than one-third of the standard body length. The fourth or longest ray is equal in length to the greatest height of the body. The first ray is a rudiment; the second is nearly half as long as the third; the third slightly shorter than the fourth; after the fourth the rays diminish rapidly in length to the ninth, which is about half as long as the lower jaw, and subsequent to which the diminution is gradual; the last ray is about as long as the first.

There is no adipose dorsal; if ever present, it was obliterated before the specimen came into our possession.

The anal fin contains 11 rays, and is inserted considerably behind the vertical from the termination of the dorsal, at a distance equal to the horizontal diameter of the eye; the length of its base is equal to half that of the dorsal, the length of its longest ray (the third) equal to that of the eighth of the dorsal.

The caudal is slightly forked, its middle rays two-thirds as long as those in the upper lobe, and about equal to the seventh dorsal ray.

The pectoral fin consists of 15 rays, is inserted under the fourth scale of the lateral line, and at a distance in front of the dorsal equal to half the greatest height of the body. Its length is equal to that of the lower jaw, and the seventh ray is prolonged to a length equal to that of the head, its tip extending to the perpendicular from the twelfth dorsal ray.

The ventral is composed of 8 rays, and its base is almost entirely in advance of the perpendicular from the origin of the dorsal; its length equals half that of the head. The two ventrals are far apart.

Radial formula: D. 17–18; A. 11; C. 19; P. 15; A. 8. Scales, 8 | 74–78 | 8.

Color brownish, the inside of the branchiostegal flap bluish-black.

A specimen (No. 38106, U. S. N. M.), 26½ inches in length, was obtained by the *Albatross* from station 2710, in a depth of 984 fathoms. A specimen (No. 33305, U. S. N. M.), 10½ inches in length, was taken by the *Albatross* from station 2051, in 1,106 fathoms. Another, 8½ inches in length, was taken by the *Albatross* from station 2550, in 1,081 fathoms, and another from station 2104, in 991 fathoms.

Vaillant identified a specimen obtained off the coast of Morocco, in 2,200 meters, with *B. Agassizii*. Günther originally described the species from a specimen taken by the *Challenger*, at station 168, off the east coast of New Zealand, at a depth of 1,100 fathoms.

Bathysaurus mollis, Günther (Challenger Report, XXII, p. 183, pl. XLVI, fig. B), comes from the South Pacific, 2,385 fathoms, and from off Yeddo, 1,873 fathoms.

HARPODON, Lesueur.

Harpodon, LESUEUR, Journal Acad. Nat. Sci., Philadelphia, V, 50 (type, *Salmo* (*Harpodon*) *microps*, Les.= *Osmerus nehereus*, Hamilton Buchanan).—ALCOCK, Ann. and Mag. Nat. Hist., 1891, II, 128; 1892, II, 356.

The type is an Indo-Pacific form which is caught in great quantities in the estuary of the Ganges, and in a dried state is known as the "Bombay Duck." Günther attributes to the deep-sea fauna a Japanese form described by him as *H. macrochir* (Fig. 60), (Challenger Report, XXII, 180, pl. XLVII, fig. A), being led to do this by the peculiar structure of the specimen. *H. squamosus*, Alcock, is from the Indian Ocean, 120, 240, 276, 300 fathoms.

Family AULOPIDÆ.

Aulopodini, BONAPARTE, Trans. Linnæan Society, XVIII, 300, 1841.
Aulopidæ, COPE, Trans. Amer. Phil. Soc. XIV, 455; Proc. American Assoc. Adv. Science, 1870, 333.
Aulopidæ, (restricted) GILL, MS.

The family *Aulopidæ* is characterized by the maxillary dilated behind, and the extension downwards of the hypocoracoids, as in many Acanthopterygii (*Gill, MS.*). Cope's definition was inaccurate.

A. Dorsal premedian. Rays not filamentous.
  1. Palatine and tongue with teeth. Adipose fin present, small.
    a. Ventrals not in front of dorsal. Snout conical........................CHLOROPHTHALMUS.
B. Dorsal postmedian. Rays of some of the fins filamentous.
  1. Second and third dorsal rays prolonged, filamentous. Palate and tongue toothed...[AULOPUS].

CHLOROPHTHALMUS, Bonaparte.

Chlorophthalmus, BONAPARTE, Fauna Italica, Pesci.—GÜNTHER, Cat. Fish., Brit. Mus., v, 403.
Hyphalonedrus, GOODE, Proc. U. S. Nat. Mus., 1881, 483.

Body rounded, terete, mouth wide, maxillaries long, posteriorly dilated. Teeth minute, in narrow bands on jaws, and on palatines, vomer, and tongue. Ventrals behind origin of dorsal. Adipose fin small. Anal short. Gill opening very wide. Branchiostegals 10. Pseudobranchiæ well developed. Scales pectinate.

CHLOROPHTHALMUS AGASSIZII, BONAPARTE. (Figure 70.)

Chlorophthalmus Agassizii, BONAPARTE, *op. cit.*, pl. 121.—COSTA, Fauna Napolitana, part I, pl. XXXV, *bis*.—GÜNTHER, Cat. Fish. Brit. Mus., v, 404 (not Voyage Challenger). GIGLIOLI, Elenco, 100.
Aulopus Agassizii, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 521.—VAILLANT, Exp. Sci. Travailleur et Talisman, 121, pl. XII, fig. 3.

Height of body 5½ in total length; head 3½ in same. Eye very large, its diameter nearly one-half length of head. Dorsal origin at one-third the distance from snout to base of caudal rays. Its height is about equal to that of the ventral and is contained 5 times in total length. Anal insertion about three-fourths of distance from snout to base of caudal. Ventral inserted under middle of dorsal. Pectorals reach nearly to the middle of the length of the body. Color greenish bronze, with silvery reflections.

Radial formula: D. 11–12; A. 9; L. lat. 60–63.

This form occurs about Naples and Sicily, where it is rare. The National Museum has specimens from Messina (No. 40071), sent by the Florence Museum. It also occurs at considerable depths in the eastern Atlantic. The French expedition obtained it off the Azores in 1,440 meters, also in the Sargasso Sea, 405 meters, and off the Cape Verdes, 460 to 580 meters.

The *Albatross* obtained specimens from various localities as follows: Stations 2314, lat. 32° 43′ N., lon. 77° 51′ W., 159 fathoms; 2667, lat. 30° 53′ N., lon. 79° 42′ 30″ W., 273 fathoms; 2264, lat. 37° 07′ 50″ N., lon. 74° 34′ 20″ W., 167 fathoms; 2398, lat. 28° 45′ N., lon. 86° 26′ W., 227 fathoms; 2543, lat. 39° 58′ 15″ N., lon. 70° 42′ 30″ W., 166 fathoms; 2624, lat. 32° 36′ N., lon. 77° 29′ 15″ W., 258 fathoms.

CHLOROPHTHALMUS CHALYBEIUS, GOODE. (Figure 71.)

Hyphalonedrus chalybeius, GOODE, Proc. U. S. Nat. Mus., III, sig. 31, 484, Feb. 16, 1881.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 223.
Chlorophthalmus Agassizii, GÜNTHER, Challenger Report, XXII, 192, pl. L. C.

Body terete, its height 6¼ in its length, its width 7¾. The least height of the tail is half that of the body. The scales are moderately strong, sharply pectinated at the edge, and arranged in regular transverse rows, overlapping in such a manner as to resemble oblique plates upon the sides. The lateral line is prominent, straight, containing about 48 scales.

Between the lateral line and the origin of the dorsal are 6½ scales, the origin of the ventral 6. The greatest length of the head to the end of the flexible flap of the operculum slightly exceeds one-fourth of the body length, and is itself slightly more than 4 times the length of the snout. The longitudinal diameter of the orbit is 4 times that of the interorbital space and enters 3 in length of head. The maxillary, broad and flattened posteriorly, is in length one-tenth of the body, and extends back to perpendicular from the anterior margin of the pupil. The articulation of the mandible is in advance of the posterior tip of the maxillary, its length slightly greater, and it protrudes beyond the snout, when the mouth is open, a distance greater than the width of the interorbital area. When the mouth is closed its tip still projects noticeably.

The dorsal fin is located almost midway between the snout and the adipose dorsal. Its height is almost equal to that of the ventral. The adipose dorsal is over the middle of the anal, its length half the diameter of the orbit.

The distance of the anal from the snout is about three-fourths of the body length. Its length of base is equal to the length of the snout; its height to that of the middle caudal rays. The caudal is furcate. The pectoral is long, subfalcate, inserted close to the branchial cleft, its tip extending to the fourteenth or fifteenth scale of the lateral line, its length twice that of the mandible.

The ventral is located two-fifths of the way from the snout to the base of the caudal, and directly under the middle of the dorsal.

Radial formula: D. 11+1; A. 8; C. 16; P. 17 or 18; V. 9 or 10; L. lat. about 48.

Color grayish mottled with brown, scales metallic, silvery.

Specimens were obtained by the *Fish Hawk* in five localities ranging in depth from 101 to 156 fathoms, and by the *Albatross* from eleven stations at depths of from 85 to 167 fathoms.

C. chalybeius is not identical with *C. Agassizii*, but is well separated by the smaller eye, longer, more conical snout, lower, more terete body, and larger scales. It closely resembles it, however, in general form. Dr. Günther's diagnosis of *C. Agassizii* in the *Challenger* volume more nearly applies to *C. chalybeius*, and his figure is apparently of *C. chalybeius*.

C. productus, Günther, was obtained off the Fiji Islands, at a depth of 315 fathoms.

C. nigripinnis, Günther, is known only from a single individual, taken by the *Challenger* off Twofold Bay, at a depth of 120 fathoms.

CHLOROPHTHALMUS TRUCULENTUS, GOODE and BEAN, n. s. (Figure 72.)

Body subterete, somewhat compressed, its height 5½ in its length, its width about 8. The least height of the tail is contained about 2⅓ in the greatest height of the body at the insertion of the dorsal. Scales moderate, cycloid, arranged in regular transverse rows, overlapping in such manner as to resemble oblique plates on the sides. The lateral line is rather inconspicuous, containing between 40 and 50 scales (on account of denuded condition of body, an accurate enumeration can not be made). There are about 6 scales between the lateral line and the origin of the dorsal, and 6 or 7 between it and the ventral. The greatest length of the head from the tip of the projecting lower jaw is a little more than one-third of the length of the body, and is contained 2½ times in the length of the snout. The lower jaw projects beyond the tip of the snout a distance equal to one-fourth the length of the snout. The diameter of the orbit is nearly equal to that of the snout, and about one-third the length of the head. The width of the interorbital space is contained twice in the longitudinal diameter of the orbit. The maxillary is broad and flattened posteriorly, is contained about 8 times in the length of the body, and does not reach to the perpendicular from the anterior margin of the orbit. The insertion of the dorsal is midway between the tip of the snout and the adipose dorsal. Its height is greater than the length of the ventral, which is equal to the greatest height of the body. The adipose dorsal is over the middle of the base of the anal, its length two-fifths of the diameter of the orbit.

The distance of the anal from the snout is about three-fourths of the body's length; the length of its base is about two-thirds that of the snout; its height equal to the diameter of the orbit. Caudal furcate. Pectoral long and strong, its length equal to the distance from the tip of the snout to the posterior margin of the orbit, and about twice that of the mandible. The ventral is inserted under the middle of the base of the dorsal, the distance from the posterior margin of the orbit equal to the distance of the latter from the snout. Color, brownish.

Radial formula: D. 1, 8; A. 1, 7; V. 9 or 10.

The species is described from a specimen about 8 inches in length, obtained by the steamer *Blake*, at station LII, off Barbadoes, in 158 fathoms.

Family BENTHOSAURIDÆ.

Benthosauridæ, GILL, MS.

Synodontoidea with well developed supramaxillaries widening backward and applied to the dentigerous intermaxillaries; pectorals inserted near the shoulders, and very long ventrals. (*Gill.*)

BENTHOSAURUS, Goode and Bean.

Benthosaurus, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, No. 5, 165.

Body long, somewhat compressed, tapering into a slender, elongate, caudal peduncle. Scales cycloid, of moderate size. Head slightly depressed; cleft of mouth wide, horizontal, the lower jaw projecting at its extremity and anteriorly at the sides. The maxilla is long, not stout, dilated posteriorly; the intermaxillary very long, styliform, tapering, immovable. The intermaxillary and mandible with bands of small teeth, of uniform size, interrupted at the symphysis. A short oblong band of similar teeth on each side of the vomer, separated by a rather wide interspace. Palate and tongue smooth. Eye very small, inconspicuous. Gill opening extremely wide, the branchiostegal membrane free from the isthmus. Gill rakers long and slender, numerous, about twice as many below the angle as above. Pseudobranchiæ absent. Branchiostegals eleven. All the fins well developed; no adipose dorsal. Dorsal fin median, anal postmedian. Caudal forked, with lower lobe produced. Ventral seven-rayed, inserted opposite the interspace between pectoral and dorsal, the outer ray produced.

Benthosaurus is closely allied to *Bathysaurus* and *Bathypterois*.

BENTHOSAURUS GRALLATOR, GOODE and BEAN. (Figure 78.)

Benthosaurus grallator, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, No. 5, 168.

Body elongate, somewhat compressed, depressed slightly forward, tapering behind into a long slender tail, its greatest height contained 7½ times in its standard length, and equaling half the length of the head, its greatest width one-third the length of the head; its height at the origin of the anal, five-sixths of its greatest height. Least height of tail half the height of the body at the ventrals. Length of caudal peduncle 6½ times its least height.

Scales very thin, cycloid, leathery, deciduous; oval in form, except at the base of the dorsal and anal fins, where they become more elongate; the horizontal diameter of a scale in the lateral line equals twice the diameter of the eye. The lateral line is straight, above the median line anteriorly, becoming median on the caudal peduncle, the tube-bearing scales being prominent, and about 55 in number. Between the dorsal fin and the lateral line are about nine rows of scales; between the latter and the anal fin, eight or nine rows.

Head twice as long as the greatest height of the body, its length contained a little less than 4 times in the standard body length, considerably depressed, scaleless except on the vertex and the preoperculum. Operculum (perhaps accidentally) denuded.

The snout is much produced, almost equal to the width of the interorbital space, which is convex. The maxilla extends far behind the posterior margin of the eye, its length equaling that of the postorbital part of the head. The mandible projects beyond the upper jaw to a distance slightly more than the diameter of the orbit, and receives the snout within its extremity when the jaws are closed. The teeth have been fully described in the generic diagnosis. The mandible has a series of seven large pores on its lower surface. There are several similar pores under the eye. The nostrils are situated about midway between the eye and the extremity of the snout, small, slit-like, the posterior about twice as large as the anterior one in each pair.

The dorsal fin contains 11 rays, and is inserted midway between the tip of the snout and the base of the middle caudal rays. The fin is highest in front, the length of the rays diminishing rapidly posteriorly. There is apparently no adipose dorsal.

The anal fin contains 12 rays and is similar in shape to the dorsal, the anterior rays being the longest, and about equal in length to the mandible; its distance from the snout is about 3 times the length of its longest ray.

The caudal is forked, its middle rays two-fifths as long as those in the upper caudal lobe; the lower lobe is much prolonged, the lower ray being more than 4 times as long as the middle rays. Its extremity is broken off in our specimen, but apparently it must have been nearly twice as long as the stump which now remains.

The pectoral fin is normal, composed of 9 rays, and is inserted close to the opercular flap; its length is slightly greater than that of the head (although mutilated), extending beyond the origin of the dorsal.

The ventral is composed of 7 rays, and its base is entirely in advance of the perpendicular from the origin of the dorsal; the inner rays reach to the vent, while its outer ray is enormously prolonged, extending far beyond the extremity of the upper caudal lobe; the length of the prolonged ray is fully 4 times that of the head. The two ventrals are close together.

Radial formula: D. 11; A. 12; P. 9; V. 7; B. 11. Scales, 9–55–8 or 9.

Color brown, the roof of the mouth and inside of the branchiostegal flap black, as well as the operculum and branchiostegal membrane.

A single specimen, 392 millimeters (15½ inches) long to the tips of the prolonged ventral rays, was taken by the *Blake*, at a depth of 1,850 fathoms, at station CLXXIV, in lat. 24° 33′ N., lon. 84° 23′ W.

A second example of the same fish, and of nearly the same size, was taken by the steamer *Albatross*, September 6, 1884, in lat. 39° 3′ 15″ N. and lon. 70° 50′ 45″ W., at a depth of 1,537 fathoms. This is well preserved, and throws additional light on the external characters of the species; the fins, especially, are more nearly perfect. Measurements of the two are given below.

	Current number of specimens.	
	CLXXIV.*	35651
Length to base of middle caudal rays...mm.	275	267
Body.—Greatest height.................do...	37	35
Greatest width.................do..	24	20
Height at ventrals ....do...	32	33
Least height of tail ....do...	16	16
Length of caudal peduncle.....do...	105	95
Head.—Greatest length ....do...	73	70
Greatest width ....do...	28	26
Width of interorbital area .... do...	20	18
Length of snout...............do...	19	18
Length of upper jaw...........do...	48	48
Length of mandible ....do...	56	53
Distance from snout to orbit....do...	21	–
Diameter of orbit ....do...	2.5	2.5
Dorsal.—Distance from snout ....do...	137	123
Length of base ....do...	35	46
Length of longest ray (first)....do...	49+	—
Length of last ray ....do...	11(?)	17
Anal.—Distance from snout....do...	152	146
Length of base...............do...	34	33
Length of longest ray (first)....do...	55	50
Anal.—Length of last ray.............mm..	12(?)	16
Caudal.—Length of middle rays. .....do...	23	19
Length of external rays, upper lobe ....mm.	59	50
Length of external rays, lower lobe ....mm..	100+	221
Pectoral.—Distance from snout........do...	67	62
Length . ...do...	77+	84
Ventral.—Distance from snout ....do...	103	99
Length ....do...	285+	240
Branchiostegals ....do...	11	—
Dorsal...................................do ..	11	11
Anal ....do...	12	13
Pectoral ....do...	9	9
Ventral ....do...	7	7
Number of scales in lateral line	55	60
Number of transverse rows above lateral line	9	9
Number of transverse rows below lateral line	8 or 9	9

* Blake.

Family BATHYPTEROIDÆ.

Bathypteroidæ, GILL, MS.

Synodontoideans with the upper pectoral ray entirely detached, thickened and developed as a tactile organ, extensible upwards. (*Gill.*)

BATHYPTEROIS, Günther.

Bathypterois, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, 5th series, II, 183.

Shape of the body like that of an *Aulopus*. Head of moderate size, depressed in front, with the snout projecting, the large mandible very prominent beyond the upper jaw. Cleft of the mouth wide; maxillary much developed, very movable, much dilated behind. Teeth in narrow villiform bands in the jaws; on each side of the broad vomer a small patch of similar teeth; none on the palatines or on the tongue. Eye very small. Scales cycloid, adherent, of moderate size. Rays of the pectoral fin much elongate, some of the upper being separate from the rest and forming a distinct division. Ventrals abdominal, with the outer rays prolonged, 8-rayed. Dorsal fin inserted in the middle of the body above, or immediately behind the root of the ventral, of moderate length. Adipose fin present or absent. Anal short. Caudal forked. Gill openings very wide; gill laminæ well developed, separate from each other; gill rakers long. Pseudobranchiæ none.

ARRANGEMENT OF THE SPECIES OF BATHYPTEROIS.

- I. Outer ventral rays filiform, simple, their extremities soft, swollen, lamelliform. Anal far behind dorsal. Dorsal origin over axis of ventrals.................................Subgenus BATHYPTEROIS
  - A. Outer ventral rays not prolonged. Uppermost pectoral rays very elongate, bifid (longer than total length of fish)...[B. LONGIFILIS, Gthr., Kermadecs.]
  - B. Outer ventral rays prolonged (extending beyond anal). Uppermost pectoral rays not prolonged beyond caudal tip...B. DUBIUS, Vaillant. E. Atlantic.
- II. Outer ventral rays filiform, simple, prolonged, adpressed or inseparably united. End of dorsal and origin of anal in same vertical or overlapping. Caudal with lower lobe usually prolonged (except in *B. quadrifilis*)..Subgenus SYNAPTERETMUS
  - A. Anal origin in nearly same vertical as end of dorsal. Dorsal origin over axis of ventrals or nearly so. Ventral rays elongate.
    - 1. Ventral outer rays adpressed. Lower caudal ray not prolonged. Upper pectoral ray not extending beyond upper lobe of caudal. A. 9; L. lat. 59......B. QUADRIFILIS, Günther. Off Brazil.
    - 2. Ventral outer rays inseparably united throughout. Lower caudal ray prolonged. Upper pectoral ray extending beyond caudal. A. 11; L. lat. 55. [B. GÜNTHERI, Alcock. Andaman Sea.]
    - 3. Ventral outer rays coherent in basal half; two or three lower caudal rays prolonged. Upper pectoral rays reach to adipose dorsal....................[B. INSULARUM, Alcock. Indian Ocean.]
  - B. Anal origin under middle rays of dorsal. Dorsal far back, far behind vertical from axis of pectorals.
    - 1. Uppermost pectoral ray as long as the fish, bifid toward its extremity. D. 13; A. 10; L. lat. 55; P. 2-17-8............................B. LONGIPES, Günther. Off east coast South America.
    - 2. Uppermost pectoral ray longer than fish, bifid from its middle. D. 12; A. 9; L. lat. 55. [B. LONGICAUDA, Günther. Middle of Southern Pacific.]

BATHYPTEROIS DUBIUS, VAILLANT. (Figure 74.)

Bathypterois dubius, VAILLANT, Exp. Sci. Trav. et Talis., Poiss., 1888, 124, pls. IX, XII, figs. 4, 4*a*; pl. XIV, fig. 4; pl. XV, figs. 4, 4*a*, 4*b*.

This species does not appear to reach a large size; the largest of the many examples, taken by the *Talisman* measuring 260 millimeters. The height is about one-eighth of the total length; the thickness nearly one-twelfth; the head two-elevenths, and the caudal one-fourth. The eye is about one-sixteenth as long as the head; the interorbital space about equal to the distance from tip of snout to center of eye. Gill opening wide. Dorsal origin a little behind origin of ventral, over about the seventeenth scale of the lateral line; longest dorsal ray two-thirds length of head; base of dorsal a little less than its longest ray.

The uppermost detached pectoral ray reaches beyond end of scales. The longest ventral ray is three-sevenths of length without the caudal. Longest anal ray about one-half head.

Radial formula: B. 12; D. 1, 14; A. 9; V. 2, 6; P. 2, 10; Sc. 6–60–8.

MEASUREMENTS.

	Millimeters.		Millimeters.
Length	243.00	Caudal	58.24
Height	31.13	Snout	16.35
Thickness	20.08	Eye	3.06
Head	45.18	Interorbital space	16.35

Bathypterois dubius, of Vaillant, is represented in his collections by seventy examples, among which he recognizes a great amount of individual variation, and more than one species may be included under this name. It resembles most closely *B. longipes*.

Examples were taken off the coast of Morocco, in depths ranging from 834 to 1,590 meters; off the Canaries, in 1,238 meters; off the Soudan coast, in 932 to 1,232 meters; on the Arguin Bank, in depths of 1,113 to 1,495 meters, and at the Azores, in 1,257 to 1,442 meters.

BATHYPTEROIS QUADRIFILIS, GÜNTHER. (Figure 75.)

Bathypterois quadrifilis, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, p. 184.—Challenger Report, XXII, 188, pl. XXXIII, fig. B.

The uppermost and lowermost of the pectoral rays are filiform, the former bifid for more than two-thirds of its length, the latter simple. Outer ventral rays much prolonged, not dilated. Dorsal inserted close to root of ventrals. Adipose fin present.

This species differs somewhat more from the preceding than these do among themselves. The greatest depth of the body is one-seventh of the total length, without caudal, the length of the head nearly one-fifth. The head is remarkably flat above, and the width of the interorbital space exceeds the length of the snout. The eye is small, but larger than in the preceding species, about one-third of the length of the snout, and one-fifth or one-sixth of the length of the postorbital portion of the head. The dentition and branchial apparatus do not offer any noteworthy peculiarity.

The dorsal fin occupies the middle between the extremity of the upper jaw and the root of the caudal fin. A narrow adipose fin is present and midway between the dorsal and caudal. The anal fin commences immediately behind the dorsal, its origin being equidistant from the roots of the pectoral and caudal. Caudal fin emarginate.

The principal distinctive feature of this species is that it possesses not only the long detached upper pectoral ray, but also an equally long lower ray, which, however, is not removed from the remainder of the fin. The upper ray becomes bifid in its proximate third, and is accompanied by an extremely short rudimentary second ray; it scarcely reaches to the caudal fin and is shorter than the lowermost ray, which may reach to the end of the caudal, and is split only at its very extremity.

The structure of the ventral fins is the same as in *Bathypterois longipes*, but the strong outer rays are somewhat curved and do not reach the end of the anal.

The scales are cycloid, as in the other species, but those behind the basal portion of the pectoral fin are deeply pectinated, provided with from 5 to 10 long and narrow teeth, of which the middle ones are the longest. (*Günther.*)

Color blackish or black; pectoral filaments whitish.

Radial formula: B. 12; D. 14; A. 9; P. 2–9; V. 9; L. lat. 59. L. transv. 6 | 8.

The types of this specimen were obtained by the *Challenger* off the coast of Brazil; two specimens, one from station 126, at a depth of 770 fathoms, one from station 121, at a depth of 500 fathoms.

The *Blake* obtained one specimen at station XCVIII, off St. Vincent, at a depth of 513 fathoms.

Two specimens, one of them 6¼ and the other 4½ inches in length, were taken by the *Albatross* at station 2385, in 740 fathoms. Another (No. 34963, U. S. N. M.), 6 inches in length, at station 2117, in 683 fathoms.

BATHYPTEROIS LONGIPES, GÜNTHER. (Figure 76.)

Bathypterois longipes, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 184; Challenger Report, XXII, 188, pl. XLVIII, fig. A.

The uppermost pectoral ray is the strongest, about as long as the whole fish, bifid towards its extremity. Outer ventral rays much prolonged, strong, but not dilated at the extremity. Dorsal fin inserted at some distance behind the root of the ventrals. Adipose fin present or absent.

Similar to *Bathypterois longifilis*, from which it differs only in the following points: Eye minute. The dorsal fin is placed farther backwards, its origin being nearly midway between the end of the snout and the root of the caudal; consequently the root of the ventral is some distance in advance of the dorsal, and the end of the dorsal is vertically opposite to the fifth anal ray. One specimen possesses, the other lacks, adipose fin. Caudal fin deeply forked, with the outer ray much produced. Of the two branches into which the posterior third of the long pectoral ray is split, one is much shorter and weaker than the other. The two outer ventral rays are closely adpressed from the root to the end, and much stouter and longer than the other rays; they are articulated to the end and without the soft pads described in the preceding species. These fin rays extend beyond the end of the anal fin. (*Günther.*)

Color black, with white fins.

Radial formula: B. 12; D. 13; A. 10; P. 2–7–8; V. 8; L. lat., 55; L. transv. 6 | 8.

The *Challenger* obtained two specimens, 9 inches long, from off the east coast of South America, station 325; depth, 2,650 fathoms.

A specimen (No. 35635, U. S. N. M.), 9 inches in length, and another specimen (No. 31804, U. S. N. M.), 3 inches in length, were obtained by the *Albatross*.

A specimen, 2½ inches long, was obtained by the *Blake* at station CXCI, in 25° 33′ N. lat., 84° 35′ W. lon., at a depth of 539 fathoms. It is too small to be studied, but appears to have only 12 rays in the dorsal. It is distinctively marked by a brown blotch on the base of the caudal rays, above and below.

Another was obtained by the *Blake* at Station CCXLVI, in 24° 36′ N. lat., 84° 05′ W. lon., at a depth of 955 fathoms.

Family IPNOPIDÆ.

Ipnopidæ, GILL, Science, III, 620, 1889—(name only).

Synodontoideans with a pair of frontal phosphorescent organs and the eyes entirely aborted. (*Gill.*)

IPNOPS, Günther.

Ipnops, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, 5th series, II, 186.—Challenger Report XXII, 190.—Nature, July 2, 1885, 205.

Body elongate, subcylindrical, covered with large, thin, deciduous scales, and without phosphorescent organs. Head depressed, with broad, long, spatulate snout, whole upper surface of which is occupied by a pair of large, transparent, lamelliform, membrane-bones, which cover a luminous organ longitudinally divided into two symmetrical halves. Eye absent. Nostrils reduced to a minute opening in front (?) of each lamina. Bones of the head well ossified. Mouth wide, with the lower jaw projecting; maxillary dilated behind. Both jaws with narrow bands of villiform teeth; palate toothless. Pectoral and ventral fins well developed, and, owing to the shortness of the trunk, close together; adipose fin none. Anal fin moderately long. Caudal subtruncated. Pseudobranchiæ none. Air bladder none. Pyloric appendages none. (*Günther.*)

IPNOPS MURRAYI, GÜNTHER. (Figures 67, 68.)

Ipnops Murrayi, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 187; Challenger Report, XXII, 191, pl. XLIX, fig. B.

Body elongate, cylindrical; tail compressed behind; head depressed. The depth of the trunk diminishes but little backwards, and is contained 13½ times in the total length, without caudal; the length of the head is one-sixth of the total. Head broad, much broader than deep, its greatest depth being two-thirds of its length. Snout broad, much depressed, with obtusely rounded anterior profile; cleft of the mouth very wide, the maxillary moderately dilated behind and extending beyond the middle of the length of the head. Mandible projecting beyond the upper jaw, broad, but owing to the depressed form of the snout its upper surface is nearly entirely at the lower side of the snout. Infraorbital chain of bones very narrow, wedged in between the transparent lamina and the maxillary, with four very distinct apertures leading into the mucous duct. The upper surface of the head, including the snout, is wholly covered by the two cornea-like laminæ of the luminous apparatus. They are closely attached to each other along the median line, each being divided by a shallow transverse ridge into a larger anterior and a smaller posterior portion. The ridge turns forward near and parallel to the median line, and marks the course of a superficial mucous duct.

The gill laminæ are well developed and the gill rakers long, needle-shaped, closely set, about 22 in number on the outer branchial arch.

The vent is nearly twice as distant from the root of the caudal fin as from the end of the snout, and rather more than the length of the head from the gill opening; it is placed between the ventral fins.

The dorsal fin commences immediately behind the vertical from the vent; it is short, but its longest rays are twice as high as the body. Origin of the anal midway between the vent and the root of the caudal, composed of rays which are more slender and shorter than those of the dorsal. Caudal fin narrow, subtruncated, more than half as long as the head. Pectorals rather feeble, lateral, as long as the caudal, and extending to the ventrals. Ventrals are composed of stronger rays, horizontally placed and somewhat distant from each other, as is frequently found in fishes habitually moving on the bottom; they slightly exceed the pectorals in length.

The scales are large, thin, deciduous, forming only six longitudinal series on each side of the trunk. Lateral line faintly indicated along the middle of the body; the muciferous channels on the head are also narrow, with small apertures. Brown, fins colorless. Buccal and branchial cavities and lower side of head black. (*Günther.*)

Radial formula: D. 10; A. 13; P. 14; V. 8; L. lat. 55.

The *Challenger* obtained it from the coast of Brazil, station 124; depth, 1,600 fathoms (one specimen, 4½ inches long). Near Tristan da Cunha, station 133; depth, 1,900 fathoms (two specimens, 5½ inches long); and north of Celebes, station 198; depth, 2,150 fathoms (one specimen, 4 inches long).

It was also obtained by the *Blake*, station CCXXXIII, lat. 24° 36′ N., lon. 84° 05′ W., 955 fathoms (one specimen), and station LXVI, off Bequia, 1,507 fathoms (one specimen).

Family RONDELETIIDÆ, Goode and Bean.

Body more or less compressed, scaleless. Head naked. No barbels. Mouth large. Margin of the upper jaw formed by the premaxillaries only. Teeth coarsely granular. Opercular apparatus complete; its bones very thin, membrane-like. No adipose fin. Dorsal fin far back; short and low; inserted opposite the anal. Pectorals short, placed rather low. Ventrals present, abdominal. Gill opening very wide; membranes deeply cleft, free from the isthmus. Pseudobranchiæ absent.

RONDELETIA, Goode and Bean, n. g.

Body oblong, compressed, scaleless. Mouth large, lower jaw slightly projecting. Teeth in bands, coarsely granular in the jaws; vomer and palatines toothless; a row of large mucous pores on the lower surface of the mandible, and extending upward on the preoperculum. Posterior nostril with a slender filament anteriorly. Eyes moderate; near the dorsal profile. Snout rather long, obtuse. Supraoccipital bones with a pair of strong spines projecting horizontally forward over the orbit. Gill membranes entirely separate; gill rakers numerous, rather long and slender. Gills 4; a narrow slit behind the fourth. Branchiostegals 7. Opercular bones thin, membranous. Dorsal short, rather low, opposite and similar to the anal. Pectorals and ventrals small. Caudal small, probably forked. No vestiges of a lateral line.

Dedicated to Rondelet, the great French ichthyologist of the seventeenth century.

RONDELETIA BICOLOR, GOODE and BEAN, n. s. (Figure 77.)

The height of the body is a little less than one-third of the total length; length of the head nearly one-half. Diameter of the eye contained 6 times in the length of the head, and twice in the length of the snout. The maxillar reaches to below the hind margin of the eye, and the intermaxillary about as far. Origin of the dorsal fin nearly opposite the vent. The anal origin immediately behind the vent, the terminations of the two opposite. The fins are low, the rays pointing horizontally backward; the longest ray in the dorsal fin about one-fifth of the length of the head, and the longest in the anal one-fourth. The pectoral fin inserted below the middle of the body, and under the end of the opercular flap; its length nearly one-fourth that of the head. Ventrals inserted behind the middle of the total length, and still farther behind the tips of the extended pectorals; their length about two-ninths that of the head, and when extended reaching beyond the vent. Color, purplish black, with cherry-colored margins to the fins; whitish in spirits.

Radial formula: B. VII; D. 14; A. 14; P. 9; V. 5.

A single specimen (No. 38202, U. S. N. M.), 4¼ inches in length, was taken by the Fish Commission steamer *Albatross* at station 2724, lat. 36° 47′ N., lon. 73° 25′ W., at a depth of 1,641 fathoms.

Family CETOMIMIDÆ, Goode and Bean.

Iniomi with body somewhat compressed, scaleless. Head naked. Lateral line conspicuous. No barbels. Mouth exceedingly large; the margin of the upper jaw formed by the premaxillaries only; the lower jaw strongly curved, and slightly projecting beyond the upper. Teeth in jaws in bands, granular. The vomer, the palatines, the pterygoids, and also the first gill arch and the lingual bones (which are greatly enlarged), as well as the upper pharyngeals, are covered with teeth of a similar character. Opercular apparatus incomplete; its bones very thin, membrane-like. No adipose fin. Dorsal fin far back, short, high, inserted opposite the anal, which it resembles. Pectorals short, placed rather low. Ventrals absent. Gill opening immense, the membranes deeply cleft, free from the isthmus. Gills 3. Pseudobranchiæ absent.

CETOMIMUS, Goode and Bean, n. g.

Body oblong, compressed, scaleless; similar in its vertical outline and proportions to that of the right whales (*Balænidæ*), a resemblance which is greatly enhanced by the shape of the enormous mouth; and in the lower jaw strongly curved, projecting slightly beyond the snout. Teeth in granular bands, covering all the bones of the mouth, tongue, and throat. Mucous pores sometimes present on the back. Nostrils far forward; open slits without flap. Eyes very small, and placed far below the dorsal profile. Gill membranes deeply cleft, not attached to the isthmus. Gill rakers absent; replaced by granular tooth-like surface upon the arch. Gills 3; no slit behind the third. Branchiostegals 9. Opercular apparatus incomplete, bones thin and membranous. Dorsal short, high, inserted very far back, directly opposite the anal, which it resembles in shape and size. Caudal peduncle short and slender. Ventrals absent. Pectorals broad and short, placed low. Caudal small, weak, probably emarginate or truncate. Lateral line broad, consisting of two furrows connected vertically by numerous short cross grooves.

CETOMIMUS GILLII, GOODE and BEAN, n. s. (Figure 78.)

The height of the body is a little less than one-fourth of the total length; length of head a little less than one-third. Eye minute; contained about 23 times in length of head, and about 8 times in that of snout; inserted midway between the margin of the jaw and the dorsal profile, distant from the former a space contained about 2½ times in the length of the snout. The maxillary reaches very far back, extending to a point behind the orbit equal to 1½ times the length of the snout. The origin of the dorsal is directly above that of the anal, which is inserted a short distance behind the vent; distance frȯm the snout equal to more than 4 times the length of its own base, and the distance of its termination from the root of the upper rays of the caudal equal to its own greatest height. The anal fin is similar in shape and extent to the dorsal, but has the thirteenth to the fifteenth rays the longest, while the eighth to the eleventh are the longest in the dorsal. The length of these longest rays is about equal in the two fins, and is contained slightly less than 3 times in the length of the head. The pectoral fin is inserted somewhat below the middle of the body and close to the extremity of the opercular flap. It is broadly lanceolate, and its length is contained about 3½ times in that of the head. Ventrals lacking. Color, blue-black. The lateral line sweeps in a bold curve from a point above the upper angle of the gill opening to a point in the middle of the body between the origin of the dorsal and anal fins, and thence in a straight median line to the base of the caudal.

Radial formula: B. 9; D. 16; A. 16; P. 16.

A single specimen (No. 35529, U. S. N. M.), 5 inches in length, was taken by the *Albatross*, August 20, 1884, at station 2206, in 39° 35′ N. lat., 71° 24′ 30″ W. lon. at the depth of 1,043 fathoms.

CETOMIMUS STORERI, GOODE and BEAN, n. s. (Figure 79.)

The height of the body is a little more than one-fourth of the total length; the length of the head is contained 3½ in that of the body. Diameter of the eye contained about 18 times in the length of the head, and about 7 times in that of the snout, the eye being inserted nearer to the dorsal profile than to the jaw, its position in the vertical being twice as far from the line of the upper jaw as from the dorsal line; it is nearly in the line of the vertical erected from the middle of the upper jaw to the right angles of its edge. The lower jaw is strongly curved, and projects far beyond the upper. The origin of the dorsal fin is a little in advance of that of the anal, which is inserted at a distance from the vent equal to 3 or 4 times the diameter of the eye. The dorsal fin is longer than the anal, the termination of the latter being under the fifth ray from the end of the dorsal. They are about equal in height, and the direction of the rays when erected is backward and at an acute angle with the axis of the body. The longest rays are contained about 2½ times in the length of the head. Pectoral fin is inserted very far down, the lower portion of its peduncle almost on the abdominal line; the fin is lanceolate, and, although mutilated, is believed to have been about half as long as the head. The lateral line sweeps in a sinuous curve from a point above the upper angle of the gill opening to a point somewhat in advance of the insertion of the dorsal, and thence in a straight line to the base of the caudal. A line of mucous pores on either side of the median dorsal line in advance of the dorsal fin.

Radial formula: D. 19; A. 16.

A single specimen (No. 35634, U. S. N. M.), 4⅝ inches in length, was taken by the Fish Commission steamer *Albatross* at station 2222, on September 6, 1884, in 39° 03′ 15″ N. lat., 70° 50′ 45″ W. lon., at a depth of 1,535 fathoms.

This species is provisionally described from a careful drawing made by Mrs. Hildebrandt, December 11, 1884, under the criticism of Dr. Bean, the type specimen being inaccessible at the time this study is made.

This species is named in honor of the late Dr. David Humphreys Storer, in token of our appreciation of the distinguished services of this pioneer of American ichthyology.

Family MYCTOPHIDÆ.

Scopelini, MÜLLER, 1843.—JORDAN & GILBERT, Bull., XVI, U. S. Nat. Mus., 279.

Scopelidæ, GIRARD, Rep. P. R. R. Survey, x, 1858, 328.—GÜNTHER, Cat. Fish. Brit. Mus., v., 1867, 328.

Myctophidæ, GILL, MS.

Body oblong or moderately elongate, compressed (except in *Scopelosaurus*), covered with scales, which are usually cycloid. Mouth wide, the entire margin of the upper jaw formed by the long and slender premaxillaries, closely adherent to which are the slender maxillaries. Teeth various, mostly villiform, and in bands in the jaw; also pterygoids, palatines, and tongue; also on vomer in adults. No barbels. Gill membranes separate, free. Branchiostegals, 8–10. Pseudobranchiæ well developed. Gill rakers long and slender. Lateral line present, the scales prominent and often enlarged. Cheeks and opercles scaly. Adipose fin present. Dorsal fin short, median, of soft rays. Pectorals and ventrals present. Anal fin moderate. Caudal forked. Air bladder small. Intestinal canal short. Sides scaly, with phosphorescent spots.

For convenience of study and comparison, it would seem somewhat desirable that the forms now usually grouped under the great polymorphous genus *Scopelus*, should be divided into minor groups. We have, therefore, proposed the provisional plan formulated in the accompanying key. Some of the groups are probably of subgeneric value.

Since the completion of our study of this family, two important papers have appeared: the first by Dr. Fed. Raffaele, published in the "Mittheilungen" of the Zoölogical Station at Naples in 1889, and secondly, Dr. Lütken's masterly and exhaustive paper on the Scopelids of the Zoölogical Museum of the University of Copenhagen, forming part 2 of "Spolia Atlantica," printed in the Memoirs of the Royal Academy of Sciences and Letters of Denmark, sixth series, Vol. VII, part 6, Copenhagen, 1892.

The first of these papers announced an important new system of discriminating between the species of fishes formerly grouped in the genus *Scopelus*, based upon the arrangement of the luminous spots, which were classified by the author in eight groups.

At the time when Dr. Raffaele's paper was brought to our attention, our book was being put in type, so that, beyond reference to it in the synonymy, it was impossible to utilize the work of the author, for it became evident that if his plan were adopted it would necessitate an entire revision of our plan of classification, and while it seemed to be full of suggestions we were not yet satisfied as to the extent of the usefulness of the proposed new plan.

The publication of Lütken's work has, however, rendered it necessary to completely revise our opinions upon the relations of the species. A review of the group in the light of Lütken's conclusions convinced us that the arrangement of the luminous spots is of the greatest value in the classification of these fishes.

MYCTOPHUM, Rafinesque.

Myctophum, RAFINESQUE, Indice d'Ittiologia Siciliana, 1810, 56; type, *Myctophum punctatum*, Raf.—BONAPARTE, Faun. Ital., Pesci, fasc. XXVII.

Nyctophus, COCCO, Giorn. Sicil. 1829, 44 (incl. *M. metopoclampus*) Lett. su Salmon. (incl. 1. *N. Rafinesquei*; 2. *N. Metopoclampus*; 3. *N. Gemelarii*; *N. Bonapartii*).

Scopelus, CUVIER, Règne Animal, ed. 2d, 1817, II, 169 (type, *S. Humboldti*).—GÜNTHER, Cat. Fish. Brit. Mus., v. 404 (part).

Body oblong, compressed, covered with cycloid scales, those in the lateral line not much enlarged. Head short, compressed, with limb of preoperculum nearly vertical. Mouth large, the jaws about equal; premaxillaries long and slender; maxillaries well developed. Snout more or less blunt and declivous. Teeth in villiform bands on jaws, palatines, pterygoids and tongue. Eye large. Gill rakers long and slender. Branchiostegals, 7–10. Air-bladder, small. Pyloric cæca, few. Pseudobranchiæ, large. Dorsal fin entirely in front

TENTATIVE ARRANGEMENT OF THE GENERA OF MYCTOPHIDÆ.

I. Body oblong, compressed. Teeth in jaws in villiform bands.
A. Pectorals present.
1. Dorsal and anal fins touching (or nearly so), the same vertical, or overlapping.
a. Lateral line not at all, or but slightly, enlarged. Scales cycloid, smooth.
i. *No luminous glands on head or tail.* (*Luminous scales sometimes present on tail, above or below.*)
x. Head short, with limb of preoperculum nearly vertical; snout more or less blunt and declivous. Precaudal photophores 2.
Dorsal entirely in front of anal, and scarcely, or not at all, overlapping. Superanal photophores in two groups .... MYCTOPHUM
Dorsal overlapping anal. Superanals in one or two groups.......... BENTHOSEMA
xx. Head long, limb of preoperculum oblique, snout conical and snake-like. Precaudal photophores 4 or 2+1.
Dorsal about equal to or shorter than anal, and not overlapping.
No orbital spines .... LAMPANYCTUS
Orbital spines .... CERATOSCOPELUS
Dorsal much longer than anal, and overlapping it.
Pectorals placed normally.................................... NOTOSCOPELUS
Pectorals placed very low.................................... CATABLEMELLA
ii. *Luminous glands on tail, but none on head.*
x. Dorsal and anal nearly equal, not touching same vertical.
Head somewhat conical, with limb of preoperculum slightly oblique.
Saddle-like gland on tail, above and below.......................... LAMPADENA
iii. *Large luminous glands on head, but none on tail.*
x. Superanal photophores in two groups.
Precaudal photophores 4.
One large, irregular gland occupying entire front of head.......... ÆTHOPRORA
Four luminous glands on head, one in front of each eye and one on each infraorbital.. COLLETTIA
Precaudal photophores none.
A gland in front of each eye below the nostril.
Photophores and cephalic glands all divided into halves by horizontal septa of black pigment.. DIAPHUS
b. Lateral line obsolescent.
i. *No luminous glands. Photophores much as in typical genus.*
x. Head long, with oblique preopercular limb.
Dorsal overlapping anal, the latter much the longer. Pectoral inserted high up.
Precaudal photophore 1. Apparently no photophores on head. TARLETONBEANIA
c. Lateral line with scales much enlarged; scales hard, persistent.
i. *Luminous glands or scales on top of caudal peduncle; none on head.*
x. Scales cycloid. Anal passing behind soft dorsal.
Body elongate, fusiform; head short, with projecting snout.
Anal much longer than dorsal, but not overlapping. Caudal peduncle slender, elongate.
One posterolateral photophore over break in superanal series. RHINOSCOPELUS
Body ovate, compressed; head short, profile declivous; snout not projecting.
Anal somewhat longer than dorsal and overlapping it slightly. Caudal peduncle short and stout.
No posterolateral photophore. Superanals in unbroken series.. ELECTRONA
xx. Scales ctenoid. Anal terminating below soft dorsal.
Body elevated, somewhat compressed. Caudal peduncle rather slender.
Anal longer than dorsal, but scarcely overlapping .... DASYSCOPELUS
2. Dorsal and anal short, similar, far apart.
a. Scales large, very deciduous, covered with minute spines.
i. *No luminous glands on head or tail.*
x. Scales along belly with luminous centers. Photophores far from normal.
Head conical; rictus short.
Dorsal and anal equal, the latter placed with its center under soft dorsal. NEOSCOPELUS
b. Scales (if present) very deciduous.
i. Mouth very large; maxillary much dilated at tip......................... SCOPELENGYS
B. Pectorals rudimentary.
1. Dorsal and anal overlapping considerably.
a. *Luminous glands on tail, above and below. Photophores minute, irregularly placed.*
i. Head long, with oblique preopercular limb; snout conical; mouth terminal, horizontal .... NANNOBRACHIUM
II. Body elongate, cylindrical. Teeth in lower jaw in several series.................. SCOPELOSAURUS

EXPLANATION OF TERMS.

The names proposed for the several groups of photophores are explained by the diagrams and the accompanying table of explanations. The names previously proposed by Dr. Raffaele (*Mittheilungen aus der zoologischen Station zu Neapel*, IX, 1889, p. 181, Pl. VII) and by Dr. Lütken (*Mémoires de l'Académie Royale des Sciences et des Lettres de Danemark, Copenhague, 6e série, Classe des Sciences* VII, 1892, p. 234, figure) are given in parallel columns.

Only the *lateral* (three groups), *anal*, and *caudal photophores* appear to have any special value in the separation of closely allied species.

NOMENCLATURE OF PHOTOPHORES.

GOODE.	RAFFAELE.	LÜTKEN.
AO. Anteorbital.	Preorbitali.	
SO. Suborbital.		
M. Mandibular.		Mandibulares.
O. Opercular.	Preoperculari.	Operculares.
P. Pectoral.	Branchiali.	Pectorales.
AL. Anterolateral.	Laterali.	Supraventrales.
ML. Mediolateral.	Do.	Supra-anales.
PL. Posterolateral.	Do.	Posterolaterales.
T. Thoracic.	Ventrali.	Thoracici.
V. Ventral.	Ventrali.	Ventrales.
A. Anal (or superanal).	Anali.	Anales anteriores.
	Post-anali.	Anales posteriores.
C. Caudal.	Codali.	Caudales.
SC. Supercaudal.		

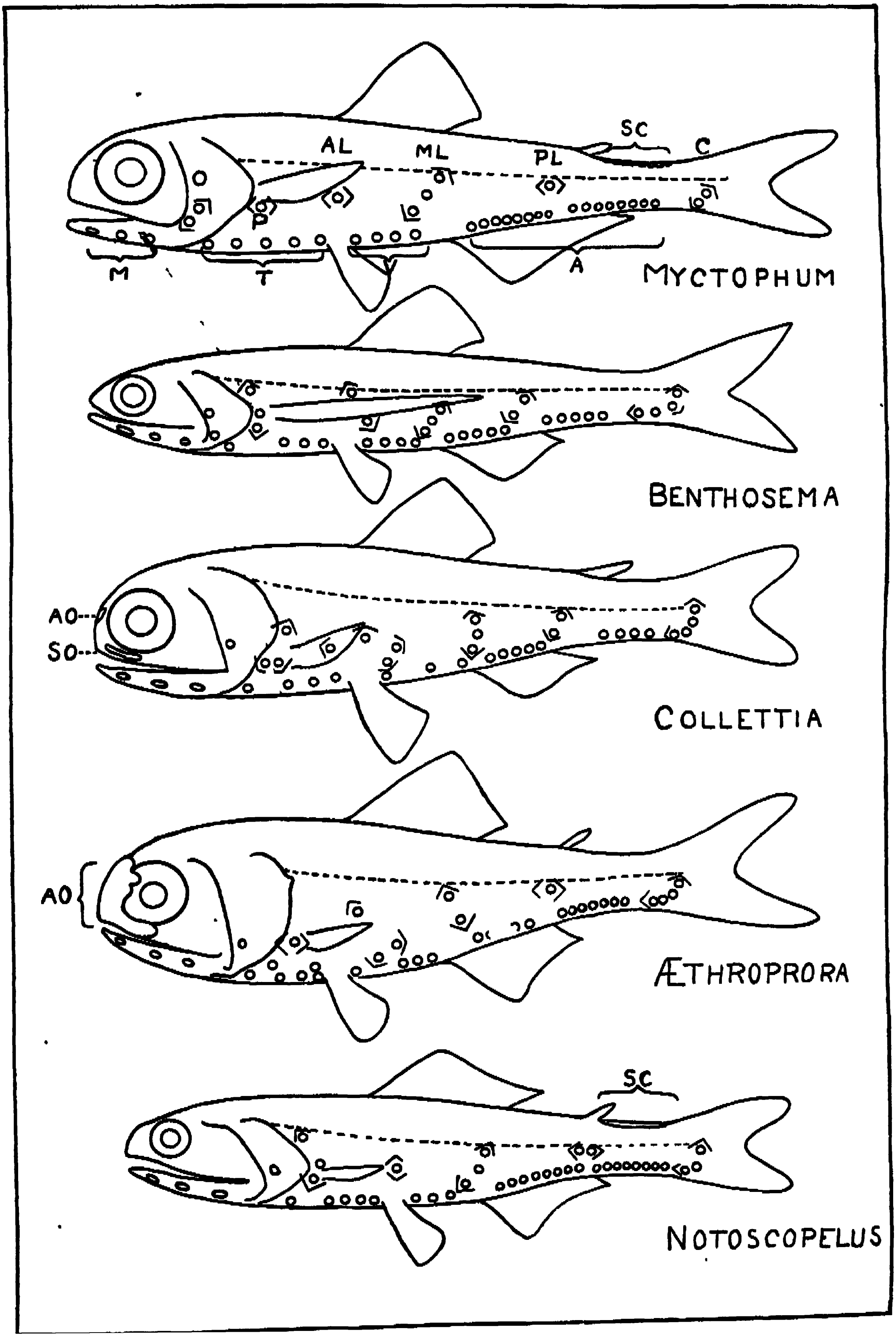

Diagram showing arrangement of photophores in the Myctophidæ.

of anal, overlapping it little or not at all. Ventrals, 8-rayed, under or but slightly in front of first dorsal rays; pectorals well developed; soft dorsal slender.

Precaudal photophores 2; superanals in two groups, with one or two posterolaterals above the interval between them.

I. Mediolateral photophores 3, in obliquely vertical line. Anterolateral 1. Posterolateral 1.
  A. Pectoral short. Precaudal photophores close together.
    1. Posterolateral in front of soft dorsal. D. 12; A. 19; L. lat. 41–45................M. PUNCTATUM
    2. Posterolateral under soft dorsal or nearly so.
      a. L. lat. 37. Superanals, 7–10 + 4–6. D. ?; A. ?..................................M. AFFINE
      b. L. lat. 40. Superanals, 8 + 6. D. 12; A. 20..................................M. OPALINUM
  B. Pectoral long, falcate. Precaudal photophores somewhat apart.
    1. Posterolateral in front of soft dorsal.
      a. L. lat. 38. Superanals, 6–7 + 7–9. D. 12; A. 21..............................M. PHENGODES
II. Mediolaterals 2, anterolaterals 2.
  A. Posterolateral 1, over break in superanal series.
    1. Pectoral long, falcate, passing second anterolateral. Precaudals somewhat apart.
      a. Posterolateral in advance of soft dorsal and behind middle of anal.
        i. L. lat. 40–42. Superanals, 7–9 + 4–9. D. 12–14; A. 20–22................M. HUMBOLDTII
    2. Pectoral moderate, not passing second anterolateral. Precaudals close together.
      a. Posterolateral far in advance of soft dorsal, and over middle of anal.
        i. L. lat. 41. Superanals, 5–7 + 11–14. D. 12; A. 19..............................M. GRACILE
  B. Posterolaterals 2, over break in anal series.
    1. Anterolaterals side by side, and continuous with first mediolateral.
      a. Anterolaterals far apart; precaudals near together, the last far below end of lateral line.
        i. L. lat. 39–40. Superanals, 5–6 + 6–7. D. 12–13; A. 17–18.......................M. BENOITI
      b. Anterolaterals close together; precaudals well separated; the last near end of lateral line.
        i. L. lat. (?). Superanals, 4–7 + 7–8. D. 11; A. 16.........................M. REINHARDTII
    2. Anterolaterals not side by side, the first above and in advance of the second, and touching lateral line.
      a. L. lat. 38–42. Superanals, 7 + 6. D. 12; A. 21–22...............................M. REMIGER
      b. L. lat. (?). Superanals, 5–7 + 6. D. 12; A. 19..................................M. HYGOMII

MYCTOPHUM PUNCTATUM, RAFINESQUE. (Figure 80.)

Myctophum punctatum, RAFINESQUE, Ind. d'Ittiologia Siciliana, 1810, 56, pl. II, Fig. 5. (*Nycthophum punctatum*, Cocco, in synonymy of his *N. Rafinesquei*.)—BONAPARTE, Icon. Faun. Ital., fasc. XXXVII, Fig.

Scopelus caninianus, CUVIER and VALENCIENNES, Hist. Nat. Poiss, XXII, p. 445.—GÜNTHER, Cat. Fish. Brit. Mus., V, 409.—CANESTRINI, Fauna d'Italia, Pesci, 124. —GIGLIOLI, Elenco, 100.—RAFFAELE, Mitt. Zoöl. Stat., Naples, IX, 183, pl. VII, Fig. 4.—LÜTKEN, Vid. Med. Naturh. Förh., 1891, 207.

Scopelus Mülleri, GOODE, Fishery Industries, etc., 1889, Part 1, Atlas, pl. CCIII.

Height of body 4½ in total length; width equal to length of eye; length of head 3¾ times. Least depth of tail two-fifths of height of body. Greatest depth of head about three-fourths of its length. Distance between posterior margin of orbit and preopercular edge one-third of diameter of eye. Snout very short, with a very inconspicuous keel on upper edge; its length scarcely one-third diameter of eye. Gill rakers 7 above and 19 below angle of first arch, the longest two-thirds diameter of eye. Eye very large, its diameter three-sevenths of length of head. The intermaxillary reaches almost to angle of preoperculum. Origin of dorsal much nearer to tip of snout than to root of caudal; the fin is very short, the length of its base equal to half that of head and less than one-sixth of total; its origin is over eleventh scale of lateral line, and is vertical with origin of ventral, the length of its longest ray equal to two-thirds length of head. Ventral far from reaching origin of anal; its length less than diameter of the eye. Pectoral reaches to middle of ventral, below twelfth scale of lateral line, its length equal to that of postorbital part of head. Adipose dorsal present, over antepenultimate ray of anal. Anal origin under twenty-first scale of lateral line; its base as long as head, and its longest ray equal to length of postorbital part of head. Caudal rather small and deeply forked. Mediolateral photophores three, in straight, obliquely ascending line; anterolateral photophore single; posterolateral single, over break in row of superanals and placed considerably in advance of soft dorsal. Precaudal photophores close together. Radial formula: D. II, 12; A. II, 19; L. lat. 41–45.

Two specimens (No. 23369, U. S. N. M.; No. 272, Gloucester Donations), 90 and 63 millimeters, were taken on the Grand Bank by the schooner *Lizzie*. Individual, 90 millimeters in length, is No. 43787, U. S. N. M ; No. 284, of the Gloucester Donations. Another (No. 23756, U. S. N. M.; No. 588, Gloucester Donations), 95 millimeters in length, washed aboard the schooner *Conductor* on the Grand Bank. A specimen (No. 934, Gloucester Donations), 100 millimeters in length, was taken by schooner *Marguerite*, off Banquero. Still another specimen (No. 24646, U. S. N. M.; No. 607, Gloucester Donations), 90 millimeters in length, washed aboard the schooner *Gatherer* on the Grand Bank. An individual (No. 43781, U. S. N. M.; No. 283, Gloucester Donations), 87 millimeters in length, with caudal somewhat imperfect, was obtained January 30, 1879, in about 44° 30′ N. lat., 54° 35′ W. lon. It washed aboard in rough weather. One (No. 608, Gloucester Donations), 83 millimeters in length, washed aboard the schooner *Plymouth Rock* on the Grand Bank during a storm. Another (No. 24648, U. S. N. M.; No. 604, Gloucester Donations), also washed aboard the schooner *Mary F. Chisholm* on southern edge of the Grand Bank. A specimen (No. 43783, U. S. N. M.; No. 573, Gloucester Donations), three specimens (No. 43788, U. S. N. M.; No. 867, Gloucester Donations), three specimens (No. 29982, U. S. N. M.), and specimens (No. 43784, U. S. N M.; No. 281, Gloucester Donations) were also obtained by the Gloucester fisherman.

The *Fish Hawk* secured three specimens (No. 28999, U. S. N. M.) from station 1044, in 38° 37′ N. lat., 73° 12′ W. lon., at a depth of 224 fathoms; and the *Albatross* captured several specimens (No. 43786, U. S. N. M.) at the surface at station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., a depth of 571 fathoms, and specimens (No. 35696, U. S. N. M.) from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms.

This species is evidently the *M. punctatum* of Rafinesque, as well as of Bonaparte. We have identified it with a number of specimens labeled "*Scopelus Caninianus*," obtained at Messina and presented by the Royal Zoölogical Museum at Florence (No. 40057, U. S. N. M.), and also with the figure and description of Bonaparte and Rafinesque. Though Rafinesque's figure does not fully agree with the description, which is manifestly careless, it has the posterolateral photophores in front of the dorsal, as in all our specimens.

We are unable to determine exactly what form is that discussed by Lütken (p. 251), under the name *Scopelus Caninianus*, Cocco, for it has the posterolateral photophore much farther back in relation to the termination of the second dorsal and anal fin than has our *M. punctatum*, and is in this respect more closely allied to Lütken's *Scopelus affinis* (p. 252).

MYCTOPHUM AFFINE, (LÜTKEN), GOODE and BEAN.

Scopelus affinis, LÜTKEN, Spolia Atlantica, II, 1892; 32, Fig. 10.

A species of *Myctophum* closely resembling *M. punctatum*, but having the posterolateral photophore farther back, under the soft dorsal and not far in advance of the vertical from the last ray of the anal, over which occurs the break in the series of superanal photophores, the number of which is 7-10+4-6. Radial formula:—(?): L. lat. 37.

Lütken examined a considerable number of specimens of this species, presumably all taken at the surface, between 38° 40′ N. lat., 63° W. lon., and 39° 54′ S. lat., 41° 30′ E. lon.

MYCTOPHUM OPALINUM, GOODE and BEAN, n. s. (Figure 81.)

Height of body contained 4⅜ times in total (without caudal); head 4¼. Least height of tail is two-fifths of height of body. Snout very short, declivous, with a well-developed median keel, its length about one-third of diameter of eye. Eye large, about 2⅜ in the head. Intermaxillary reaches nearly to angle of preoperculum and is broadly expanded at its extremity and partly concealed by the large scales of the cheek. Space between eye and hinder edge of preoperculum only one-half diameter of eye. Origin of dorsal much nearer to tip of snout than to root of caudal, midway between snout and adipose fin, over eleventh scale of lateral line and very slightly behind vertical through origin of ventral. Length of dorsal base is two-thirds that of head. Origin of ventral under tenth scale of lateral line; it does not reach to vent. Pectoral short, its length nearly two-thirds that of head. Adipose dorsal present; its origin over thirtieth scale of lateral line. Anal origin under eighteenth scale of lateral line; the end of its base under thirtieth scale. Length of anal base equals that of head. Caudal is rather small and moderately forked.

Mediolateral photophores three, in straight, obliquely ascending line; anterolateral one; posterolateral one, under soft dorsal and over and slightly in advance of break in row of superanals, which is above root of last ray of anal. Number of superanals 8+6.

In most of the specimens of *M. opalinum* examined, the 6 or 8 scales on the top of the caudal peduncle, immediately in front of the caudal fin, are luminous.

MYCTOPHUM PHENGODES, (LÜTKEN), GOODE and BEAN.

Scopelus phengodes, LÜTKEN, Spolia Atlantica, II, 1892, 253, Fig. 11.

A species resembling in general appearance our *Myctophum punctatum*, from which it is distinguished by having a long, falcate pectoral, the tip of which extends almost to the vertical from the vent, and is nearer to the row of mediolateral photophores than to the anterolateral. This form has, as in *M. punctatum*, the posterolateral considerably in advance of the soft dorsal, and has the precaudal photophores much farther apart (a character upon which some stress is laid by Lütken, but which seems to us of less importance than the position of the posterolateral photophore). Number of superanals, 6–7+7–9.

Radial formula: D. 12; A. 21; L. lat. 38.

Lütken had it from the Atlantic, south of the equator, presumably from surface.

MYCTOPHUM HUMBOLDTII (RISSO). (Figure 82.)

Gasteropelecus Humboldti, RISSO, Icth. Nice, 358, pl. 10, fig. 38.
Scopelus Humboldti, RISSO, Mem. Accad. Sc. Torino, XXV, 1820, 266, pl. 10, fig. 2.—GUNTHER, Cat. Fish. Brit. Mus., V. 407.—GIGLIOLI, Elenco, 100.

Height of body is one-fifth of total length (without caudal), length of head two-sevenths. Least depth of tail two-fifths of height of body; depth of head 1⅗ in its length. Diameter of eye a little less than one-third of length of head; distance between posterior margin of orbit and preopercular edge one-half diameter of eye. Snout short, obtuse, its upper profile descending in strong curve. Maxillary reaches nearly to angle of preoperculum, and slightly dilated behind. Origin of dorsal somewhat nearer to end of snout than to root of caudal, above root of inner ventral rays; its last ray before vertical from origin of anal. Pectoral extends to posterior third of ventral. Scales smooth, stiff. Mediolateral photophores, 2; anterolaterals, 2; posterolateral, 1, (over break in anal series) which, as in *M. punctatum*, is considerably in advance of the vertical connecting the root of the soft dorsal with those of the last rays of the anal. Caudal photophores somewhat apart as in *M. phengodes*. Superanals 7–9+4–9. Radial formula: D. 12–14; A. 20–22; L. lat. 40–42.

This species was first described from the Mediterranean about Nice, but appears to be rare. The British Museum had specimens from the eastern Atlantic. The *Albatross* obtained a specimen (No. 43772, U. S N. M.) upon the surface, at 7 p. m., from station 2727, in 36° 35′ N. lat., 74° 03′ 30″ W. lon., and also a very fine specimen (No. 43773, U. S. N. M.) from station 2724, in 36° 47′ N. lat., 73° 25′ W. lon., at a depth of 1,641 fathoms.

Lütken had a number of specimens of *M. Humboldtii* (*op. cit.*, p. 254, fig. 2) from the following localities: N. lat. 34° 20′, W. lon., 18° 30′; N. lat. 12° 12′, W. lon. 28° 48′; S. lat. 7° 6′, W. lon. 11° 30′; S. lat 33° 30′, W. lon. 11°; S. lat 37° 40′, E. lon. 78° 34′; S. lat. 37°, E. lon. 5°; S. lat. 39° 54′, E. lon. 41° 30′; S. lat. 29° 30′, E. lon. 12°; S. lat. 25° 40′, E. lon. 23°; S. lat. 12°, E. lon. 103° 50′; S. lat. 11° 15′, E. lon. 103° 50′; N. lat. 10° 40,′ E. lon. 110°.

Lütken unites *M. boops* with *M. Humboldtii*, but since the latter has been as yet found only in the northeastern Pacific, we prefer to hold them apart until specimens from the two oceans have been studied side by side. The scales in lateral line are said to number 37–9.

MYCTOPHUM GRACILE, (Lütken), Goode and Bean.

Scopelus gracilis, Lütken, Spolia Atlantica. II, 1892, 255, fig. 13.

A species closely allied to *M. Humboldti*, having mediolateral photophores two, anterolateral two, posterolateral one, over the break in the anal series, which is much in front of *the soft dorsal and over the middle of the anal fin, the number of anal photophores being 5–7+11–14. The pectoral is moderate, not passing the second anterolateral photophore.* The caudal photophores are *close together* as in *M. punctatum.*

Radial formula: D. 12; A. 19; L. lat. 41.

Lütken had several specimens, presumably from the surface, taken in the following localities: M. lat. 22°, W. lon. 34° 30′; N. lat. 22° 12′, W. lon. 48°; S. lat. 35° 36′, E. lon. 27° 40′; between S. lat. 32° 40′, E. lon. 55° 20′, and S. lat. 11° 50′, E. lon. 8° 10′.

MYCTOPHUM BENOITI, (Cocco), Goode and Bean. (Figure 83.)

Scopelus Benoistti, Cocco, Lett. s. Salmon, 12, pl. II, fig. 4.

Scopelus Benoiti, Bonaparte, Icon. Faun. Ital., Pesc., c. fig.

Canestrini, Faun. d'Italia, Pesci, Fasc. XXXVII.—Günther, Cat. Fish. Brit. Mus., V. 406.—Giglioli, Elenco, 100.—Raffaele, Mitt. Zool. Stat., Naples, IX, 181, pl. VII, fig. 2.—Lütken, Spolia Atlantica, 1892, II, 256, fig. 14.

The height of the body is contained 4 times in the total length (without caudal); the head 3¼. The snout is obtuse, conical, the upper and lower profiles nearly equally curved. The eye is large, its diameter a little less than half the length of the head. The dorsal is postmedian, nearly midway between the snout and the root of the caudal, and behind the base of the ventral. The pectoral extends nearly to the end of the ventral. The photophores are arranged as follows: Mediolaterals, 2; anterolaterals, 2; posterolaterals, 2, over the break in the superanal series, which is not far in advance of the vertical connecting the base of the last anal rays with that of the soft dorsal. The two anterolaterals far apart, the caudals near together, the last far below the end of the lateral line. Number of superanals, 5–6+6–7.

Radial formula: D. 12–13; A. 17–18; L. lat. 39–40.

Günther gives Norway and Greenland as the range of this species, but cites no authority for this, and appears to have examined only Mediterranean material. The species has been observed at Nice and Messina, whence the National Museum has specimens (Cat. No. 40063) received from the Royal Museum of Florence. Lütken had a specimen, 40 millimeters long, from N. lat. 34° 40′, W. lon. 24° 20′. His type, as well as the Messina specimen examined by us, has a luminous plate on the top of the caudal peduncle.

MYCTOPHUM REINHARDTII (Lütken).

Scopelus Reinhardtii, Lütken, Spolia Atlantica, II, 1892, 257, fig. 16.

A species of *Myctophum* resembling *M. Benoiti* in general appearance, but having the anterolateral photophores much closer together than in that species, the foremost being, as in *M. Benoiti*, almost directly above the root of the ventral fin. The precaudals are well separated, the posterior one considerably above the anterior, and touching the extremity of the lateral line. Pectoral long, falcate, extending quite to the lower mediolateral photophore, and almost to the vertical from the vent. The number of the superanals is 4–7+7–8.

Radial formula: D. 11; A. 16.

The two examples studied by Lütken were obtained from N. lat. 34° 22′, W. lon. 18° 10′, and N. lat. 5° 31′, W. lon. 23° 15′. One of these had a luminous plate on the top of the caudal peduncle, the other a similar plate below.

MYCTOPHUM REMIGER, Goode and Bean, n. s. (Figure 84.)

Depth of body is one-fourth of total length. Length of head 3⅔ times in total length. Least height of tail about two-thirds of its greatest height. Snout very short, the upper and lower profile of the head being similar; its length a little less than one-half diameter of eye. Eye large, nearly two-fifths length of the head. Intermaxillary reaches as far back as maxillary, nearly to angle of the preoperculum. Maxillary expanded posteriorly and concealed under large scales of cheek. Space between eye and hinder edge of preoperculum one-third diameter of the eye. Origin of dorsal nearer tip of snout than root of caudal, being over eleventh scale of lateral line, and nearly over origin of ventral. Base of dorsal two-thirds as long as head, and length of longest ray equals length of head without snout. Ventral does not quite reach vent. Pectoral as long as head, and reaches to above anal origin. Anal origin nearly under end of dorsal base. The length of anal base is a little greater than that of head. Caudal rather small and forked.

Posterolaterals, 2, over break in superanal series and far apart, the anterior one, nearly over middle of anal fin, the posterior one about one scale in advance of the vertical from the root of the soft dorsal. Anterolaterals widely separated, the first obliquely in advance of and above the second, and touching or upon the lateral line; the second far behind the root of the ventral and over the interval between the first and second postventral photophores. Superanals 7+6. Radial formula: D. 12; A. 21–22; L. lat. 38–42.

This species is closely related to, if not identical with, *M. Hygomii* of Lütken. If they prove to be identical, Lütken's name has priority.

This species is described from eight specimens (No. 43792, U. S. N. M.) obtained at the surface by the steamer *Albatross* at station 2573, in 40° 34′ 18″ N. lat., 64° 09′ W. lon. They were attracted by the electric light. The largest example is 75, and the smallest 56 millimeters in length. Six specimens (No. 38193, U. S. N. M.) were also taken by the *Albatross* at the surface at 7 p. m. at station 2727, in 36° 35′ N. lat., 74° 03′ 30″ W. lon.; specimens (No. 33482, U. S. N. M.) from station 2073, in 41° 54′ 15″ N. lat., 65° 39′ W. lon., taken at the surface; No. 38171, U. S. N. M., from station 2724, in 36° 47′ N. lat., 73° 25′ W. lon., at a depth of 1,641 fathoms; No. 43793, U. S. N. M., from station 2742, in 37° 46′ 30″ N. lat., 73° 56′ 30″ W. lon., in 865 fathoms; No. 43974, U. S. N. M., from station 2731, in 36° 45′ N. lat., 74° 28′ 30″ W. lon. (probably at surface); and No. 43795, U. S. N. M., from station 2719, in 38° 29′ N. lat., 71° 58″ W. lon., at a depth of 1,536 fathoms.

The *Fish Hawk* also obtained three examples (No. 28942, U. S. N. M.) from station 1034, in 39° 56′ N. lat., 69° 26′ W. lon., at a depth of 146 fathoms.

MYCTOPHUM HYGOMII, (LÜTKEN), GOODE and BEAN.

Scopelus Hygomii, LÜTKEN, Spolia Atlantica, II, 1892, 257, fig. 15.

A species closely related to *M. remiger*, Goode and Bean, if not identical with it, the arrangement of the photophores being very nearly the same, except that the anterolaterals are somewhat more widely separated vertically, the anterior and upper one being above the origin of the ventral, the posterior and lower one above the second post-ventral photophore. The pectoral, though long and falcate, does not extend so far back, not closely approaching either the most advanced of the mediolaterals or the vertical from the vent. The posterolaterals are much closer together than in *M. remiger*, and the precaudals farther apart, the posterior one being relatively higher and placed nearly upon the extremity of the lateral line, instead of being quite below it, as in *M. remiger*. Number of superanals 7+6 or 5–6+6.

Radial formula: D. 12; A. 19; P. 14; V. 8.

Lütken had specimens from the following localities: N. lat. 38°, W. lon. 22° 20′; S. lat. 35° 12′, E. lon. 26°; S. lat. 39° 54′, E. lon. 41° 30′; between S. lat. 23° 30′, E. lon. 81°, and S. lat. 24° 30′, E. lon. 75° 50′.

BENTHOSEMA, Goode and Bean.

This form differs from the typical *Myctophum* by the fact that the dorsal is considerably shorter than the anal, but overlaps it, reaching to the vertical from the middle. It has the body elongate, the caudal peduncle somewhat stout, the eyes large, the snout very short, with declivous upper profile; maxillaries considerably dilated behind; scales of the lateral line considerably enlarged. Mediolaterals, 2, in subhorizontal line, continuous with the two anterolaterals. (*βένθος*, the ocean depth; *σῆμα*, a constellation of stars.)

To this genus apparently belong, in addition to the type species, *B. Mülleri* (=*B. glacialis*, Reinhardt, as identified by Lütken), the two species described by Lütken now under the names *Scopelus arcticus* and *Scopelus Colletti.* The species described by us under the name *Benthosema Güntheri* is now referred to our modified genus *Lampanyctus.*

BENTHOSEMA MÜLLERI, (GMELIN), GOODE and BEAN. (Figure 85.)

Salmo Mülleri, GMELIN'S Linnaeus, Systema Naturae, I, 1788, 1378.

Scopelus Mülleri, COLLETT, Norges Fiske, Tillaegsh. til Forh. Vid. Selsk., Christiania, 1874, 152.—Norske Nordhavs Expedition. 1876–1878, Fiske, 1880, 158.—GOODE and BEAN, Bull. Mus. Comp. Zool. X.

Scopelus glacialis, REINHARDT, Oversigt Kgl. D. Vid. Selsk. Nat. Math. Afh. Copenhagen, h., VI, CX, 1837.—Dansk. Vidensk. Selsk., 1838, VII, 115, 126.—NILSSON. Skand. Faun., Fisk., 483.—KRÖYER, Naturhist, Tidsk., II, 1847, 230.—GAIMARD, Voy. Skand., Poiss. Atl., pl. XVI, fig. 2.—GÜNTHER, Cat. Fish. Brit. Mus., V. 407; Challenger Report, XXII, 96.—Lütken, Vid. Med. Nat., Foren., 1891, 204; Spolia Atlantica II, 1892, 251, fig. 8.

Myctophum glaciale, JORDAN and GILBERT, Bull. XVI, U. S. N. M., 283.

Height of body about equal to length of head, and is contained 4 times in total length; the depth of head about equal to its length. Eye large, its diameter more than one-third length of head. Snout very short, obtuse, with upper profile descending in a very strong curve. Cleft of mouth oblique; maxillary reaching to angle of preoperculum and terminating in triangular dilation. Origin of dorsal a little nearer the tip of snout than root of caudal, and inserted well behind root of ventral. Pectoral very small, its length equal to diameter of eye. Ventral does not reach to the vent. Scales smooth, those of lateral line larger. A luminous spot on the angle of the preoperculum. Mediolaterals, 2, in subhorizontal line continuously with the two anterolaterals; posterolateral, one, over break in series of anals. Superanals 6–7+8–9. Radial formula: D. 12–14; A. 16–18; V. 8, L. lat. 36–40.

This species, until recently known only from the coast of Greenland and the northern shores of Norway, has been frequently taken since 1881 by the U. S. Fish Commission off the southern shores of New England, and also by the *Blake* at numerous stations mentioned below. Collett believes it to have been obtained by the Norwegian North Atlantic Expedition in a dredge which was worked at a depth of 1,110 fathoms. The depth of the west Atlantic was from 300 to 600 fathoms, and it was found as far south as the coast of South Carolina. The specimens are usually in a very soft and battered condition, indicating that they have been obtained at a considerable depth; and Collett found in the stomach of one of those examined by him an ostracod (*Concœcia borealis*), which has never been found nearer the surface than at a depth of 300 fathoms. Günther and Collett believe it to be truly bathybial, and the testimony of the Fish Commission explorers tends in the same direction with regard to these as to the majority of the other species of the family.

Specimens of this species were obtained by the *Blake* from the following localities: One specimen from station CCCIII, in 41° 34′ 30″ N. lat., 65° 54′ 30″ W. lon., at a depth of 306 fathoms; three specimens from station CCCXXXIV, in 38° 20′ 30″ N. lat., 73° 26′ 40″ W. lon., at a depth of 395 fathoms; one specimen from station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; three specimens from station CCCXXIX, in 34° 39′ 40″ N. lat., 75° 14′ 40″ W. lon., at a depth of 603 fathoms, and two specimens in bad condition from station CCCXXXII, in 35° 45′ 30″ N. lat., 74° 48′ W. lon., in 263 fathoms.

Specimens were received from the *Fish Hawk* as follows: Three specimens (No. 28851, U. S. N. M.) from station 952, in 39° 55′ N. lat., 70° 28′ W. lon., at a depth of 396 fathoms; two specimens (No. 28950, U. S. N. M.) from station 1029, in 39° 57′ N. lat., 69° 16′ W. lon., at a depth of 458 fathoms, and three specimens (No. 28839, U. S. N. M.) from station 953, in 39° 52′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 724 fathoms. Also by the *Albatross* at the following stations: Ten specimens (No. 32672, U. S. N. M.) from station 2002, in 37° 20′ 42″ N. lat., 74° 17′ 36″ W. lon., at a depth of 641 fathoms; four specimens (No. 35643, U.

S. N. M.) from station 2187, in 39° 49′ 30″ N. lat., 71° 10′ W. lon., at a depth of 420 fathoms; eight specimens (No. 32665, U. S. N. M.) from station 2001, in 37° 46′ 30″ N. lat., 74° 00′ W. lon., at a depth of 519 fathoms; five specimens (No. 33473, U. S. N. M.) from station 2083, in 40° 26′ 40″ N. lat., 67° 05′ 15″ W. lon., at a depth of 959 fathoms; three specimens from station 2110, in 35° 12′ 10″ N. lat., 74° 57′ 15″ W. lon., at a depth of 516 fathoms; one specimen from station 2428, in 42° 48′ N. lat., 50° 55′ 30″ W. lon., at a depth of 826 fathoms; one specimen from station 2470, in 44° 47′ N. lat., 56° 33′ 45″ W. lon., at a depth of 224 fathoms; one specimen (No. 32666, U. S. N. M.) from station 2003, in 37° 16′ 30″ N. lat., 74° 20′ 36″ W. lon., at a depth of 641 fathoms; two specimens from station 2561, in 39° 38′ N. lat., 71° 42′ W. lon., at a depth of 500 fathoms, and two specimens from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; from station 2023, in 37° 48′ N. lat., 74° 01′ 30″ W. lon., at a depth of 377 fathoms; from station 2045, in 40° 04′ 20″ N. lat., 68° 43′ 50″ W. lon., at a depth of 373 fathoms; No. 35613, U. S. N. M., from station 2201, in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms; from station 2587, in 39° 02′ N. lat., 72° 38′ W. lon., at a depth of 404 fathoms; No. 33313, U. S. N. M., from station 2039, in 38° 19′ 26″ N. lat., 68° 20′ 20″ W. lon., at a depth of 2,369 fathoms; No. 33470, U. S. N. M., from station 2076, in 41° 13′ N. lat., 66° 00′ 50″ W. lon., at a depth of 906 fathoms; No. 33503, U. S. N. M., from station 2094, in 39° 44′ 30 ′ N. lat., 71° 04′ W. lon., at a depth of 1,022 fathoms; No. 35454, U. S. N. M., from station 2188, in 39° 54′ 30″ N. lat., 71° 08′ W. lon., at a depth of 235 fathoms; No. 33299, U. S. N. M., from station 2050, in 39° 42′ 50″ N. lat., 69° 21′ 20″ W. lon., at a depth of 1,050 fathoms; No. 33394, U S. N. M., from station 2075, in 41° 40′ 30″ N. lat., 66° 35′ W. lon., at a depth of 855 fathoms; No. 33284, U. S. N. M., from station 2034, in 39° 27′ 10″ N. lat., 69° 56′ 20″ W. lon., in 1,346 fathoms; from station 2427, in 42° 46′ N. lat., 51° 00′ W. lon., in 523 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., in 538 fathoms, and No. 33547, U. S. N. M., from station 2101, in 39° 18′ 30″ N. lat., 68° 24′ W. lon., in 1,686 fathoms.

Still other specimens were obtained by the *Fish Hawk* from the following localities: No. 28884, U. S. N. M., from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; No. 28774, U. S. N. M., from station 936, in 39° 46′ 30″ N. lat., 69° 47′ W. lon , at a depth of 705 fathoms; No. 28935, U. S. N. M., from station 1031, in 39° 57′ N. lat., 69° 19′ W. lon., at a depth of 538 fathoms; No. 31757, U. S. N. M., from station 1125, in 40° 03′ N. lat., 68° 56′ W. lon., at a depth of 291 fathoms; No. 28877, U. S. N. M., from station 995, in 39° 40′ 30″ N. lat., 71° 31′ W. lon., at a depth of 358 fathoms; No. 31583, U. S. N. M., from station 1096, in 39° 53′ N. lat., 69° 47′ W. lon., at a depth of 317 fathoms; Nos. 26139, 26091, and 26131, U. S. N. M., from station 880, in 39° 48′ 30″ N. lat., 70° 54′ W. lon., at a depth of 252½ fathoms; No. 28945, U. S. N. M., from station 1030, in 39° 58′ 30″ N. lat., 69° 15′ W. lon., at a depth of 337 fathoms; No. 28775, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat, 60° 49′ W. lon., at a depth of 506 fathoms; No. 26090, U. S. N. M., from station 881, in 39° 46′ 30″ N. lat., 70° 54′ W. lon., at a depth of 325 fathoms; No. 26169, U. S. N. M., from stations 891, in 39° 46′ N. lat., 71° 10′ W. lon., at a depth of 480 (?) fathoms, and 893, in 39° 52′ 20″ N. lat., 70° 58′ W. lon., at a depth of 372 fathoms; No. 31585, U. S. N. M., from station 1095, in 39° 55′ N. lat., 69° 47′ W. lon., at a depth of 321 fathoms; from station 1157, in 40° 14′ N. lat., 70° 29′ 15″ W. lon., at a depth of 62 fathoms; No. 31779, U. S. N. M., from station 1141, in 39° 32′ N. lat., 71° 57′ W. lon., at a depth of 389 fathoms; No. 28783, U. S. N. M., from station 938, in 39° 51′ N. lat., 69° 49′ 15″ W. lon., at a depth of 317 fathoms, and No. 31764, U. S. N. M., from station 1140, in 39° 34′ N. lat., 71° 56′ W. lon., at a depth of 373 fathoms. And by the *Albatross*, from station 2554, in 39° 48′ 30″ N. lat., 70° 40′ 30″ W. lon., at a depth of 445 fathoms; from station 2569, in 39° 26′ N. lat., 68° 03′ 30″ W. lon., at a depth of 1,782 fathoms; at the surface at station 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., and at the surface in about 39° N. lat., 72° W. lon.

Lütken is disposed to believe that the two Mediterranean species, *Scopelus Heideri* and *Scopelus Veranyi* are very closely allied to this species.

BENTHOSEMA ARCTICUM, (LÜTKEN), GOODE and BEAN.

Scopelus articus, LÜTKEN, Spolia Atlantica, II, 1892, 249, Fig. 6.

A species apparently more closely related to *B. Mülleri* than to any other form, but having no posterolateral photophore and no break in the series of superanals, the number of which is fifteen or sixteen. It has two mediolaterals in subhorizontal line, continuous with the two anterolaterals. It is a much shorter-bodied form than *B. glacialis*, and has a much shorter and higher first dorsal. Lütken's figure shows only one opercular photophore, instead of two, which are customary. Radial formula: D. 9; A. 17; P. 14; V. 8.

Lütken's types were four specimens obtained from Greenland and one from Davis's Strait. Two of them have a large supracaudal luminous plate, and three others small infracaudal luminous plates.

BENTHOSEMA COLLETTI, (LÜTKEN), GOODE and BEAN.

Scopelus Colletti, LÜTKEN, Spolia Atlantica, II, 1892, 249, Fig. 7.

A species having the photophores arranged somewhat as in *B. arcticum*, but with the two mediolaterals in a subvertical line continuous with the last of the ventral photophores, instead of approximately with the anterolaterals. There is no posterolateral photophore. The superanals are in a continuous row, 16–17 in number. Head somewhat blunt; pectoral short, as in *B. arcticum*, reaching about to the vertical from the origin of the first dorsal.

Radial formula: D. 15; A. 21; L. lat. 38.

This species is described from a single specimen in the Museum at Christiania, obtained from the Pacific, 600 miles west of Cape Horn.

LAMPANYCTUS, Bonaparte.

Lampanyctus, BONAPARTE, Faun. Ital., fasc. XXVII.—GÜNTHER, Cat. Fish. Brit. Mus., v, 414 (as subgenus).

Myctophid fishes, with long head, conical snout, limb of preoperculum oblique; dorsal about equal to or shorter than anal, and not overlapping. Lateral line not much enlarged. Scales cycloid, smooth. No orbital spines. Scales smooth, those in the lateral line scarcely larger than the others. Maxillary scarcely dilated behind. Precaudal photophores 4 or 2+1.

KEY TO THE SPECIES OF LAMPANYCTUS.

I. Pectorals long; precaudals in two groups (2+1, 3+1, or 2+2), the last on or near end of lateral line.
    A. Mediolaterals 2; posterolaterals 2, nearly under soft dorsal.
        1. D. 12–13; A. 14–15; L. lat. 38-9; superanals 6–8+8–12 .... L. CROCODILUS.
        2. D. 13; A. 15; L. lat. 32–3; superanals 7+6 .... L. ALATUS.
    B. Mediolaterals 3; posterolaterals 2, in advance of soft dorsal; precaudals 3+1.
        1. D. 12–13; A. 14–13; L. lat. 36; superanals 5+5.
            a. Anterolaterals 2; pectoral extending beyond mediolaterals and to middle of anal........... L. GÜNTHERI.
        2. D. 12–13; A. 13; L. lat. (?); superanals 7+5.
            a. Anterolaterals none; pectoral not reaching mediolaterals or origin of anal..... L. WARMINGII.
II. Pectorals long; precaudals 4, in continuous, nearly horizontal, row, not approaching end of lateral line.
    A. Mediolaterals 2; posterolaterals 2, nearly under soft dorsal.
        1. D. 12; A. 16; L. lat. 38; superanals 7+8.
            a. Anterolaterals 3, horizontal, nearly in line with lowest mediolateral........... L. GEMMIFER.
III. Pectorals short; precaudals 4, in low, nearly horizontal line, not approaching end of lateral line.
    A. Mediolaterals 3.
        1. Posterolaterals 2, in advance of soft dorsal.
            a. D. 14; A. 12; L. lat. 35; superanals 4–5+5–6.............................. L. GEMELLARII.
            b. D. 12–13; A. 19; L. lat. 33; superanals 6+5.............................. L. CŒRULEUS.
        2. Posterolateral 1, placed under soft dorsal.
            a. D. 12· A. 12–13; L. lat. 36: superanals 5–7+5.............................. L. LACERTA.

LAMPANYCTUS CROCODILUS (RISSO), GOODE and BEAN. (Fig. 86.)

Gasteropelecus crocodilus, RISSO, Ichthyologie de Nice, 1810, 357.
Scopelus crocodilus, RISSO, Mem. Accad. Sc. Turin., XXV, 1820, 265, Pl. X, Fig. 1; Hist. Nat. Europe Méridianale, 1826, III, 466.—RAFFAELE, Mitt. Zoöl. Stat. Naples, IX, 184, Pl. VII, Fig. 10.

Height of body one-fifth of total length; length of head two-sevenths. Least depth of tail slightly greater than half the height of body. Head three-fifths as high as long. Eye moderate, contained 5 times in length of head. Posterior margin of preoperculum obliquely descending backwards as in *L. gemellarii*, but in an even sharper angle, to allow for the expansion of the enormous reptile-like mouth. The mouth is slightly oblique, curved; the maxillary reaches nearly to the angle of the preoperculum, and is but slightly dilated behind. Origin of the dorsal fin in advance of a point midway between the extremity of the snout and the root of the caudal by a distance equal to space from lobe of snout to posterior margin of orbit and placed farther back than usual in relation to the ventrals, its origin being above the axil of the latter. Caudal large, furcate. Pectoral lanceolate, long, and strong, its tip extending to the vertical from the middle of the dorsal. Scales smooth, those of the lateral line very slightly enlarged.

Mediolateral photophores, 2; posterolaterals, 2, one above the other, or nearly so. Precaudal photophores in two groups, 2+1 or 3+1, the last at the end of the lateral line. Number of superanals 6+8. Radial formula: D. 12-13; A. 14; L. lat. 38-39.

This, one of the rarest of scopelids, has been obtained only from the Mediterranean, in the vicinity of Nice. Giglioli obtained it at Messina in September, 1878. The National Museum has one (No. 40049) from Nice, obtained from the Florence Museum.

LAMPANYCTUS ALATUS, GOODE and BEAN, n. s. (Figure 92.)

Height of the body 5 times in total length (without caudal); length of head 3½ times. Least depth of tail about one-half greatest height of body. Eye large, its diameter equal to one-third of length of head. Snout short; upper and lower profile deeply curved, and with a median crest; its length less than one-half diameter of eye. Mouth large; length of upper jaw equal to greatest depth of body. Origin of dorsal nearer to tip of snout than to root of caudal. Pectoral fin very long, reaching to at least middle of anal base. Ventral short, not reaching to origin of anal. Anal origin under end of dorsal. Caudal moderate and deeply forked. A small phosphorescent body on the upper and lower edges of the tail at the root of the caudal; length of lower patch a little greater than diameter of eye.

Mediolateral photophores, 2; posterolateral, 2, the latter one above the other or nearly so. Precaudals in two groups, 2+1 or 3+1, the last at the end of the lateral line. Posterolaterals nearly under soft dorsal. Number of superanals, 7+6.

Radial formula: D. 13; A. 17-18; L. lat. 32-33.

This species is described from three specimens (No. 43769, U S. N. M.), the largest 55 millimeters in length, with an imperfect tail, taken by the *Albatross* from station 2393, in 28° 43′ N. lat., 87° 14′ 30″ W. lon., 525 fathoms.

LAMPANYCTUS GÜNTHERI, GOODE and BEAN, n. s. (Figure 90.)

Height of body contained 5½ times in total without caudal. Body much compressed. Length of head is contained 3⅜ times in total. Least depth of tail one-half greatest depth of body. Eye nearly 4 times in length of head. Snout short, about one-half diameter of eye. Mouth oblique, very large, the maxilla extending nearly to angle of preoperculum. Maxilla very little dilated posteriorly. Length of upper jaw about two-thirds that of head. Dorsal origin a little nearer to tip of snout than to root of ventral, immediately over origin of ventral and eleventh or twelfth scale of lateral line. Anal origin under the sixteenth scale of lateral line, its base short, about two-thirds length of head. Adipose fin present, small, entirely behind the base of the anal. Nine rows of scales between its posterior margin and the root of the caudal. Pectorals very long, reaching to above middle of anal. Ventral reaches almost to anal origin. Caudal moderate, well forked. Mediolaterals, 3; posterolaterals, 2. Precaudals, 3-4, the last at the end of the lateral line. Posterolaterals in advance of the first dorsal, forming a gently curved series continuous with anterior half of broken superanal series.

Radial formula: D. 13; A. 13. Scales, 36.

A single specimen (No. 43777, U. S. N. M.), 52 millimeters in length, was obtained by the Gloucester fleet, it being No. 190 of the Gloucester series.

The species is dedicated to the author of the *Catalogue of the Fishes of the British Museum* and the *Fishes of the Challenger*, monumental works, which are the foundations of ichthyological work in the last half of the nineteenth century.

LAMPANYCTUS WARMINGII, (LÜTKEN), GOODE and BEAN.

Scopelus (*Notoscopelus*) *Warmingii*, LÜTKEN, Spolia Atlantica, II, 1892, 259, fig. 19.

A species closely allied to *Lampanyctus Güntheri*, having long pectorals, and precaudals 3+1, the last at end of lateral line. Superanals, 7+5. Radial formula: D. 12; A. 13.

This species is distinguished from *L. Güntheri* by having one more precaudal photophores in the first group and by having a shorter pectoral, which does not reach to the origin of the anal, while in *L. Güntheri* it extends far behind the end of the pectoral and nearly to the middle of the base of the anal. The posterolaterals, one or two in number, are continuous in the gently curved series of the anterior half of the broken superanal series.

LAMPANYCTUS GEMMIFER, GOODE and BEAN, n. s. (Figure 88).

Height of body is contained 5½ times in total length; length of head 3⅔ times. Least depth of tail two-thirds height of body. Eye large, nearly one-fourth length of head. Distance between posterior margin of orbit and preopercular edge equals diameter of eye. Snout obtuse, very short, its length less than half diameter of eye. Maxillary scarcely dilated behind. Origin of dorsal midway between tip of snout and dorsal mirror. Base of dorsal equal to length of postorbital part of head, and about equal to longest dorsal ray. Ventral origin slightly in advance of dorsal origin. Pectoral reaches slightly beyond origin of anal. Scales smooth, those of the lateral line scarcely larger than others. Mediolateral photophores, 2; posterolaterals, 2, the latter one above the other, or nearly so. Precaudals, 4-5 in nearly horizontal though curved row, the last far below the end of the lateral line. Anterolaterals, 3, in nearly continuous line with lowest prepectoral and mediolaterals. Number of superanals 7-8. The pearly mirror upon the upper edge of the caudal peduncle as long as the eye, and much longer than the one extending from the end of the anal to the root of the caudal; slender and narrow, two-thirds as long as the head.

Radial formula: D. II, 12; A. II, 16, V. 8, P. 15, 16. Scales 5, 38, 5.

Gill rakers, 6 above and 12 below angle of first arch; longest two-thirds as long as eye.

A single individual (No. 35604, U. S. N. M.), the type of the species, 7½ inches in length, was taken by the *Albatross* at station 2201, in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms. *Scopelus Bonapartii* of Cocco and Bonaparte is nearly allied.

LAMPANYCTUS GEMELLARII, (COCCO), GOODE and BEAN. (Figure 87.)

Nyctophus Gemellarii, COCCO, Alcuni Salmon, 1840, 26, pl. III, fig. 9 (Nittofo di Gemellaro).
Myctophum Gemellarii, BONAPARTE, Faun. Ital. Pesc. fasc. 37, XXXVII, pl.
Scopelus Gemellarii, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 445.—GÜNTHER, Cat. Fish. Brit. Mus., V, 415.—GIGLIOLI, Elenco, 101.—RAFFAELE, Mitt. Zool. Stat. Naples, 183, pl. VII, fig. 8.
Scopelus uraeoclampus, FACCIOLA, Naturalista Siciliano.

Height of body one-fourth of total length; length of head contained 3½ times in total length. Least depth of tail one-half the height of body. Height of head equal to distance from anterior margin of pupil to end of opercular flap. Eye moderate, its diameter 3⅔ in length of head. Snout moderate, with obtuse tip. Cleft of mouth slightly oblique, curved downward below eye. Origin of dorsal slightly in advance of origin of ventral; equidistant from origin of adipose dorsal and anterior margin of orbit. Pectoral half as long as ventral. Dorsal much taller and longer than anal, but closely resembling it in form.

Mediolateral photophores, 3; anterolaterals, one or two, the former in an obliquely vertical row, as in *M. punctatum*. Precaudals in low, horizontal line. A single posterolateral in front of soft dorsal. Superanals, 4–5, 5–6. Radial formula: D. 14; A. 12; L. lat, 35.

This species, described by Cocco, from Sicily, and named by him in honor of Dr. Carlo Gemellaro, of Catania, a local geologist of note, has been found only about Messina, where it is regarded as very rare, although Giglioli obtained nine individuals at the time of his great capture of scopelids, in September, 1878. One of these (Cat. No. 44170, U. S. N. M.) was given by him to the National Museum.

LAMPANYCTUS CŒRULEUS, (KLUNZINGER), GOODE and BEAN.

Scopelus cœruleus, KLUNZINGER.
Scopelus (*Notoscopelus*) *cœruleus*, LÜTKEN, Spolia Atlantica, 260, fig. 20.

A species apparently closely related to *L. Gemellarii*, though somewhat more slender, as shown in the figure of Lütken. The main point of difference appears to be in the comparatively elongate anal fin, which contains nineteen rays instead of twelve, as in *L. Gemellarii*, but the figure given by Lütken does not show an elongate anal fin.

LAMPANYCTUS LACERTA, GOODE and BEAN, n. s. (Figure 89.)

Height of the body one-fifth total length (without caudal); length of head 3½ times in total; greatest depth of head two-thirds of its length. Eye moderate; its diameter contained 3½ times in length of head. Snout somewhat obtuse, rounded, with strong keel; its length about one-half diameter of eye. Cleft of mouth somewhat oblique, maxillary reaching to angle of preoperculum and somewhat dilated. Origin of dorsal is much nearer tip of snout than root of caudal. Pectoral slender, its middle rays elongate. Ventrals inserted slightly behind the origin of dorsal, and reach to base of first anal ray. Anal inserted behind end of dorsal base. Caudal large, forked. Photophores arranged somewhat as in *M. punctatum*.

Mediolaterals, 3; posterolateral, 1; the former in an obliquely vertical row, as in *M. punctatum*, the latter under the soft dorsal. Precaudals in low horizontal line. Number of superanals 7+5. Three large pits in the mandibles also show luminous qualities. Color, apparently light brown; the scales opalescent.

Radial formula: D. 13; A. 15; L. lat. about 36.

This species is described from three specimens (No. 43778, U. S. N. M.) obtained by the *Albatross* from station 2401, in 28° 38′ 30″ N. lat., 85° 52′ 30″ W. lon., at a depth of 142 fathoms. The *Albatross* also obtained specimens from the following localities: No. 43779, U. S. N. M., from station 2548, in 39° 56′ N. lat., 70° 14′ 30″ W. lon., at a depth of 200 fathoms; No. 43780, U. S. N. M., a very fine specimen, 57 millimeters in length, taken at the surface at station 2300, in 35° 41′ 30″ N. lat., 74° 48′ 30″ W. lon., in 671 fathoms; No. 43801, U. S. N. M., from station 2583, in 39° 50′ 45″ N. lat., 71° 43′ W. lon., in 131 fathoms; and at surface, after dark, at station 2426, in 36° 01′ 30″ N. lat., 74° 47′ 30″ W. lon.

The *Fish Hawk* obtained an individual (No. 28733, U. S. N. M.) at station 925, in 39° 55′ N. lat., 70° 47′ W. lon., at a depth of 224 fathoms; and also specimens (No. 28893, U. S. N. M.) from station 1026, in 39° 50′ 30″ N. lat., 71° 23′ W. lon., at a depth of 182 fathoms.

CERATOSCOPELUS, Günther.

Ceratoscopelus, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 405 and 412 (as subgenus).

Myctophid fishes, having the dorsal and anal fins touching the same vertical, but scarcely overlapping. Scales of the lateral line somewhat enlarged. Head long; limb of preoperculum oblique; snout conical and snake like. Orbital spines present. No luminous glands on head or tail. Precaudal photophores 1.

CERATOSCOPELUS MADERENSIS (LOWE). (Figure 91.)

Scopelus maderensis, LOWE, Proc. Zoöl. Soc., 1839, 87; 1850, 250; Trans. Zoöl. Soc., III, 14 (types from Madeira, now preserved in the British Museum).—RAFFAELE, Mitt. Zoöl. Stat. Naples, IX, 184, Pl. VII, Fig. 9.—LÜTKEN, Vid. Med. Naturh. Foren., 1891, 208.—GÜNTHER, Cat. Fish, Brit. Mus., v, 412.

Scopelus Bonapartii, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 449.—JOHNSON, Ann. and Mag. Nat. Hist., x, 1862, 281 (specimens from Madeira).

Height of body one-fifth of total length; length of head nearly one-third. Least height of tail nearly one-half greatest height of body. Snout moderate. Mouth large, oblique; jaws equal. Maxillary very slightly expanded behind. Ventral reaches to vent, and pectoral almost as far back as ventral. Anal origin under about nineteenth scale of lateral line.

Radial formula: D. 13; A. 12; L. lat. 34–36 (36 in the specimen examined).

This species, as described by Lowe from Madeira, and afterwards obtained by Johnson from the same locality, has also been found in the Mediterranean. The National Museum has specimens from Messina, presented by the Royal Zoölogical Museum of Florence. A single specimen (No. 32811, U. S. N. M.) examined by us was obtained by the *Albatross* from station 2014, in 36° 41′ 05″ N. lat., 74° 38′ 55″ W. lon., at a depth of 373 fathoms, in 1883. The range of this species is thus extended westward nearly 4,000 miles.

Two individuals (No. 21690, U. S. N. M.; No. 199, Gloucester Donations), the longer 80 millimeters in length, the other 68 millimeters, were taken by one of the Gloucester fishing vessels on the fishing banks. Also, No. 21689, U. S. N. M. (No. 219, Gloucester Donations), 75 millimeters in length. Additional specimens (No. 28978, U. S. N. M.), in very bad condition, were taken by the *Fish Hawk* from station 1038, in 39° 58′ N. lat., 70° 06′ W. lon., at a depth of 146 fathoms. An example (No. 28934, U. S. N. M.), 72 millimeters in length, was taken by the *Fish Hawk* from station 1031, in 39° 57′ N. lat., 69° 19′ W. lon., at a depth of 255 fathoms; two (No. 33564, U. S. N. M.), from station 2101. in 39° 18′ 30″ N. lat., 68° 24′ W. lon., at a depth of 1,686 fathoms; and a single individual (No. 43810, U. S. N. M.), from station 1044, in 38° 37′ N. lat., 73° 12′ W. lon., at a depth of 224 fathoms; another (No. 43776, U. S. N. M.), from station 2528, surface (electric light).

NOTOSCOPELUS, Günther.

Notoscopelus, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 405, 411 (as subgenus).

Myctophids, with the dorsal fin much longer than the anal, and overlapping the anterior half of the latter. Body elongate. Snout obstusely conical; jaws equal in front; cleft of mouth nearly horizontal; maxillary not dilated behind. No luminous glands on head or tail. Arrangement of photophores irregular: anterolaterals, 1 or none; mediolaterals, 2 or 3; posterolaterals, 1, 2, or 3. Precaudals 2+1, the last one high up, and between the flap of the operculum and the lateral line.

The type of this genus is *Lampanyctus resplendens*, Richardson. The Eigenmanns have set apart as a new genus, under the name "*Catablemella*," a form characterized by the low pectorals," the type being *Notoscopelus brachychir*. (Proc. Cal. Acad. Sci., 2d ser., III, 24.)

The National Museum has specimens from Nice (Cat. No. 40057, U. S. N. M.), sent by the Royal Museum at Florence, labeled "*Scopelus elongatus*," which evidently belong to this genus, having 21 rays in the dorsal, 17 or 18 in the anal, the height of the body contained 5 times in its length, and the eye one-fourth the length of the head. They would appear to be closely related to *N. resplendens*, which, however, has not hitherto been announced from the Mediterranean. This form is evidently that described and figured by Costa.

KEY TO THE SPECIES OF NOTOSCOPELUS.

I. Mediolaterals 3, in curved, subvertical line. Posterolaterals 2–3.
  A. Posterolaterals 2, horizontally side by side. Precaudals 2+1.
    1. Last posterolateral in advance of soft dorsal. Pectoral strong, falcate.
      a. D. 21–24; A. 18. L. Lat. 38. Superanals 16.................................N. RESPLENDENS.
    2. Posterolaterals under soft dorsal. Pectoral weak and short.
      a. D. 21; A. 20. L. lat. 42. Superanals 8+8.....................................N. QUERCINUS.
      b. D. 16; A. 14. L. lat. —. Superanals 9+7.................................N. MARGARITIFERUS.

I. Mediolaterals 3, in curved, subvertical line.—Continued.
  B. Posterolaterals 2, horizontally side by side. Precaudals 2+2.
    1. First posterolateral under soft dorsal, second behind it.
      a. D. 21–24; A. 17–18. L. lat. —. Superanals 8–7+6–7................N. ELONGATUS (of Lütken).
  C. Posterolaterals 3, horizontally side by side. Precaudals 2+1.
    1. Last posterolateral under soft dorsal. Pectoral short and weak.
      a. D. 20–21; A. 16. L.lat. 46. Superanals 9+4.................................N. CASTANEUS.
II. Mediolaterals 2. Posterolateral 1.
  A. Precaudals 2+1, the last at end of lateral line.
    1. Posterolateral 1, in advance of soft dorsal.
      a. D. 20; A. 18. L. lat. 36. Superanals 7+4 (?)............................N. CAUDISPINOSUS.

NOTOSCOPELUS RESPLENDENS (RICHARDSON). (Figure 94.)

Lampanyctus resplendens, RICHARDSON, Voy. Ereb. and Terr., Ichth., 42, pl. 27, figs. 16–18.—CUVIER and VALENCIENNES, XXII, 452.

Scopelus resplendens, GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 415.

Scopelus crocodilus, CUVIER and VALENCIENNES, XXII, 447 (not Risso).

Height of body 5 times in total length (without caudal); length of head 3½ or 3⅜; least depth of tail more than one-half height of body. Eye moderate; distance between posterior margin of orbit and preopercular edge less than diameter of eye. Posterior margin of preoperculum descending obliquely backwards. Snout obtusely conical, with jaws equal in front. Cleft of mouth nearly horizontal. Maxillary reaches to angle of preoperculum and scarcely dilated behind. Origin of dorsal midway between the extremity of snout and adipose fin, and above root of ventral; its last ray above middle of anal. Pectoral fin shorter than ventral, and not extending beyond its root. Scales perfectly smooth, those of lateral line rather larger than others.

Mediolaterals 3, in curved subvertical line; posterolaterals 2, horizontally side by side, the posterior one in advance of the soft dorsal. Precaudals 2+1, the last slightly below the end of the lateral line. Radial formula: B. 8; D. 21–24; A. 18; V. 8; scales 3 | 38 | 5.

This species was described from the Gulf of Guinea. It is very desirable that the Bohuslän species should be examined, as well as those in the museum at Milan.

NOTOSCOPELUS QUERCINUS, GOODE and BEAN, n. s. (Figure 97.)

Height of body 5⅔ in total length; length of the head 3⅔–4. Eye moderate, contained nearly 4 times in length of head (3½ in eye). Snout short, about one-half as long as the diameter of the eye. Mouth oblique, and very large, the maxillary extending to angle of preoperculum. Length of upper jaw about four-fifths that of head. Origin of dorsal much nearer tip of snout than root of caudal, being over the twelfth scale of the lateral line and immediately above origin of ventral; length of its base equals that of head, and longest ray two-thirds as long as head, its end over seventh ray of anal. Pectoral short, not reaching to origin of ventral. Anal origin about under twenty-first scale of lateral line; the length of the base equals that of head without snout, and the longest ray is about one-half as long as head. Adipose fin very slender, its distance from end of dorsal equaling one-half length of head. Caudal moderate, deeply forked.

Mediolaterals 3, in curved subvertical line; posterolaterals 2, under the soft dorsal: precaudals 2+1, the last below the end of the lateral line. One of the precaudals very high up, between the flap of the operculum and the lateral line.

Radial formula: D. 21–24; A. 19–20; L. lat. 42.

The species is described from a specimen (No. 43789, U. S. N. M.; No. 822, Gloucester Donations), 125 millimeters in length, taken by one of the Gloucester fishing vessels.

The *Albatross* obtained a specimen (No. 43790, U. S. N. M.) from station 2731, in 36° 45′ N. lat., 74° 28′ W. lon., at a depth of 781 fathoms, and also a young specimen (No. 43791, U. S. N. M.), at the surface by electric light, at station 2528, in 41° 47′ N. lat., 67° 37′ 30″ W. lon., at a depth of 677 fathoms.

This species is very closely allied to *Scopelus elongatus*, as figured by Raffaele (Mitt. Zool. Stat. Naples, IX, 185, pl. VII, fig. 11), and also agrees with a specimen sent (from Nice) under that name by the Florence museum. We should identify our specimens with the *S. elongatus* of Costa, but for the unsettled state of opinions among European ichthyologists. Steindachner, Vinciguerra, Raffaelle, and Collett seem all disposed to recognize but one species of *Notoscopelus.* We think we have distinguished four, but possibly our series is not sufficiently complete to justify us in positive opinions.

NOSTOSCOPELUS MARGARITIFERUS, GOODE and BEAN, n. s. (Figure 98.)

Height of body one-fifth of total length (without caudal); length of head one-fourth. Least height of tail one-half of greatest height of body. Snout very short and compressed into a keel on its upper edge; its length scarcely more than one-half diameter of the eye. Gill rakers, 9 or 10 above the angle, about 16 below; the longest about two-thirds the diameter of eye. Eye moderate, about one-fourth length of head. Intermaxillary reaches almost to angle of preoperculum. Space between eye and hinder edge of preoperculum much less than diameter of the eye. Origin of dorsal much nearer tip of snout than root of caudal. Length of dorsal base nearly one-third of total (without caudal); origin of dorsal about over ninth scale of lateral line, and in same vertical with origin of ventral. The ventral does not quite reach to origin of anal. Pectoral very short, its length only one-third that of head. No adipose dorsal. Anal origin under eighteenth scale of lateral line. The base of the fin is as long as head without snout. Caudal moderately forked. On top of the caudal peduncle a long, linear mirror, nearly one-half as long as head, its width about one-third of its length. Several large phosphorescent spots on inner edge of mandible, a large one near angle of preoperculum

Mediolaterals, 3, in curved, subvertical line. Posterolaterals, 2, under soft dorsal. Superanals 9+7. Precaudals 2+2, the last below end of lateral line.

Radial formula: D. 16; A. 14.

A specimen of this species (No. 43775, U. S. N. M.; No. 933, Gloucester Donations) was taken off Banquero by the schooner *Alice M. Williams.* Another specimen (No. 43774, U. S. N. M.; No. 404, Gloucester Donations) has also been obtained.

NOTOSCOPELUS CASTANEUS, GOODE and BEAN, n. s. (Figure 95.)

Depth of body 5⅓ in total length; length of head, four times. Eye moderate, its diameter nearly four in length of head, and more than twice in length of snout. Mouth exceedingly wide, oblique, with jaws equal; maxillary extending backwards almost to angle of preoperculum. Intermaxillary as long as maxillary, and toothed throughout its entire length. Maxillary very little expanded posteriorly. Origin of dorsal fin very much nearer tip of snout than root of caudal, being as far from snout as from front of pearl-colored patch on top of tail; origin somewhat in advance of origin of ventral; base is considerably longer than head; the longest ray equals length of postorbital part of head. Caudal deeply forked. Pectoral small, and does not reach nearly to ventral; its length not much more than one-third that of head. Ventral insertion under fourth ray of dorsal; its length about one-half that of head. Anal base nearly equal to head without snout.

Mediolaterals, 3, in curved subvertical line; posterolaterals, 3, horizontally side by side. Precaudals 2+1, last below the end of the lateral line. Last posterolateral under soft dorsal. Number of superanals, 9+4. Radial formula: D. 20–21; A. 16; L. lat., about 46.

This species is described from a specimen (No. 31706, U. S. N. M.), 5⅓ inches long, taken by the *Fish Hawk* from station 1,113, in 39° 57′ N. lat., 70° 37′ W. lon., at a depth of 192 fathoms. Another example (No. 21688, U. S. N. M.; No. 189, Gloucester Donations), six inches in length, was obtained on the fishing banks by the schooner *William Thompson.*

NOTOSCOPELUS CAUDISPINOSUS (JOHNSON). (Figure 96.)

Scopelus caudispinosus, JOHNSON, Proc. Zoöl. Soc., 1863, 42.—GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 416.

Height of body contained 5⅓ in total length; length of head, 3⅜. Eye moderate. Snout obtusely conical, with jaws equal in front. Cleft of mouth rather oblique. Origin of dorsal fin midway between extremity of snout and adipose fin, and above base of outer ventral rays; its last ray behind vertical from middle of anal. A series of from six to nine small spines bent backwards, above and below, before the root of caudal. Pectoral fins shorter than ventral, and not extending beyond its root.

Mediolaterals, 2; posterolaterals, 1; precaudals, 2+1, the last at the end of the dorsal line. The single posterolateral in advance of the soft dorsal. Number of superanals 7+4 (?).

Radial formula; D. 36; A. 18; V. 8; L. lat., 36–38.

This species, of which a single type in bad condition, 6¼ inches in length, is preserved in the British Museum, has hitherto been recorded only from Madeira. A single specimen (No. 43768, U. S. N. M.), eighty millimeters in length, was taken by the steamer *Albatross* from station 2569, in 39° 26′ N. lat., 68° 03′ 30″ W. lon., at a depth of 1,782 fathoms.

The western Atlantic specimen has 19 rays in the anal and 38 scales in the lateral line.

LAMPADENA, Goode and Bean, n. g.

Myctophid fishes with elongate form of *Benthosema*, having dorsal and anal fins nearly equal and not touching the same vertical. No luminous glands upon the head, but one upon the caudal peduncle above and another in similar position below. Head somewhat conical. Snout short, obtusely conical, the upper and lower profiles nearly equal; cleft of mouth and limb of operculum slightly oblique; lower jaw prominent, maxillary reaching to the angle of preoperculum, and terminating in a triangular dilation. Precaudals two groups, the last by itself at the termination of the lateral line. Pectoral not reaching to vertical from origin of ventral or anterolateral photophore. Tubes of lateral line luminous.

LAMPADENA SPECULIGERA, Goode and Bean, n. s. (Figure 99.)

Height of body 4½ in total length; length of head 4. Least depth of tail three-fifths height of body. Greatest depth of head about three-fourths of its length. Eye very large its diameter about one-third length of head. Distance between posterior margin of orbit and preoperculum edge about one-half diameter of eye. Snout short, conical, its length, about one-third diameter of eye. Cleft of mouth somewhat oblique, the lower jaw included. Posterior tip of maxillary distant from angle of preoperculum a space almost equal to length of snout. Origin of dorsal nearer tip of snout than root of caudal by a distance equal to two-thirds the length of its own base, and inserted nearly over root of ventral, over eleventh scale of lateral line, its last ray over vent, in advance of origin of anal. Pectoral does not reach nearly to vertical from origin of ventral, its length being equal to one-half that of upper jaw, and a little greater than diameter of eye. The ventral does not reach to vent, and its length is equal to about one-half that of head. Scales smooth; those of the lateral line not larger than the others, the tubes passing through them luminous. Eight scales between the adipose fin and the margin of the pearl-colored dorsal patch; there are 35 scales in the lateral line, 4 above and 5 below it. The luminous spot, two-thirds as long as the diameter of the eye, club-shaped, on the top of the tail immediately in front of the base of the caudal ray. A similar spot on the lower edge of the caudal peduncle, a little in advance of the origin of the caudal rays, its posterior edge about in line with the center of the dorsal patch; its length about three-fourths the diameter of the eye.

A luminous gland above and below on the caudal peduncle; no postanal series of superanal photophores, these being replaced by the subpeduncular glands. Anterolateral, 1; posterolaterals, 2; precaudals in two groups, the anterior and lower one of two photophores, widely separated from the posterior and single one, which is placed at the end of the lateral line. The single posterolateral is under the root of the soft dorsal, and considerably behind the termination of the anal. Gill rakers 6 above and 13 or 14 below the angle, the longest about one-half as long as the diameter of the eye.

Radial formula: D. 13; A. 14; V. 8; P. very small; Scales 4 | 39 | 5.

Color, purplish brown; very glossy, almost iridescent.

An individual (No. 43796, U. S. N. M.), 50 millimeters in length, was taken by the *Albatross* at station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms.

ÆTHOPRORA, Goode and Bean, n. g.

Body oblong, compressed, resembling in general form *Myctophum;* covered with large scales, those in the lateral line very slightly larger than the others. Head compressed. Snout very obtuse, and short, projecting slightly beyond orbital margin, the jaws about equal. Eye moderate. Dorsal fin premedian, entirely or almost entirely in advance of the anal, which it closely resembles in shape and dimensions. Ventral with 8 rays inserted under the anterior portion of the dorsal. Pectorals moderate, placed low. Adipose fin long and prominent. A prominent luminous gland of irregular form occupies the front of the head in advance of eye, encroaching upon the anterior margin of the orbit, and extending beyond it above and below. A luminous spot of greater or less extent upon the body at the angle of the preoperculum and, in some species, others upon the interoperculum and upon the sides of the lower jaw.

Superanal photophores in two groups; posterolaterals sometimes present, sometimes absent. Precaudal photophores, 4, forming a more or less crescent-shaped line at the base of the lower caudal lobe, a large, irregular gland occupying entire space in front of eye.

(Etymology: 'Αιθος=glow, and πρωρα=a face).

KEY TO THE SPECIES OF ÆTHOPRORA.

I. Scales in lateral line 40.
  A. Antero and mediolaterals and superanal photophores irregularly arranged........A. METOPOCLAMPA.
II. Scales in lateral line 35–36.
  A. Anterolaterals 2, mediolaterals 2, posterolaterals none..A. LUCIDA.
  B. Anterolateral 1, mediolaterals 3 or 4, posterolaterals 2....................................A. EFFULGENS.

ÆTHOPRORA METOPOCLAMPA (Cocco), GOODE and BEAN. (Figure 101.)

Nyctophus metopoclampus, COCCO, Giorn. Scien. Sicil. Palermo, 1829, No. 77, 144 (*Nittofo frontelucida*); Alcuni Salmonidi, 1838, 24, Pl. III, Fig. 8.—BONAPARTE, Faun. Ital. Pesc., fasc., XXXVII, 1840, Fig.

Scopelus metopoclampum, CUVIER and VALENCIENNES, Hist. Nat. Poiss, XXII, 442.

Scopelus metopoclampus, GÜNTHER, Cat. Fish. Brit. Mus., V, 409.—Giglioli, Elenco, 100.—RAFFAELE, Mitt. Zoöl. Stat., Naples, IX, 183, Pl. VII, Fig. 6.

Height of body contained 4¼ in total length (without caudal); length of head 3½ times. Least depth of tail half the height of body. Head slightly longer than high. Eye large, diameter one-third that of head. Profile almost perpendicular, an elaborate luminous plate occupying the entire space between the eyes, extending backward between the lower margin of the orbit and the upper jaw to a point behind the vertical from the middle of the orbit, and also with a lobe on either side above, impinging upon the anterior upper limb of the orbit. Cleft of mouth slightly oblique, its length nearly twice the diameter of the orbit. The maxillary reaches the angle of the preoperculum, and is not dilated behind. The origin of the dorsal and ventral fins is in the same vertical, that of the latter equidistant from the tip of the snout and the adipose fin, that of the former equidistant from the anterior margin of the orbit and adipose fin. The insertion of the last dorsal ray over the origin of the first anal ray. Pectoral two thirds as long as ventral, its tip reaching slightly beyond vertical connecting origin of dorsal and anal. Scales smooth; those of lateral line slightly larger.

The photophores are small and not very conspicuous. In the example studied, there are 11 in superanal series, there being a broad break over the root of the last anal rays, with 5 in front and 6 behind it, the single posterolateral being placed far above, near the lateral line, and forming an equilateral triangle with the two placed on either side of the break. Mediolaterals, 2, placed obliquely and far apart, the anterior and highest above the origin of the anal, the posterior and lower about midway between this and the first in the anal series, which is over the interval between the roots of the third, fourth and fifth branched rays of the anal fin. Anterolaterals, 3, placed in the form of an isosceles triangle, the apex of which is represented by the most anterior of the group, which is placed over the axil of the ventral and about three-fourths of the way from its root to the lateral line; a fourth photophore, possibly also to be grouped here, is nearly midway between the axil of the pectoral and the axil of the dorsal. Radial formula: D. III, 13; A. III, 14; L. lat. 40.

This species has been found only in the Mediterranean. Raffaele had six specimens from Messina, and Giglioli obtained two others from the same locality in the latter part of September, 1878, one of which, presented by him to the National Museum (Cat. 44160), is the type of the foregoing description. The species seems to be exceedingly rare, even in the Mediterranean. The great extension and elaboration of the nasal luminous plate shown in the figure, may be due to sexual conditions. At all events, as has been remarked, it is unlike that shown by Raffaele, though sufficiently similar to that of Cocco and Bonaparte.

ÆTHOPRORA LUCIDA, Goode and Bean, n. s. (Figure 102.)

Height of body contained 4½ times in total length; length of head 3⅜ times. Least depth of tail 2⅓ in height of body. Head considerably longer than high, its height equal to distance from anterior margin of pupil to end of opercular flap. Eye moderate, its diameter nearly one-fourth length of head. Snout short, but less declivous and obtuse than in *A. metopoclampa.* A pearl-colored luminous organ touching the limb of orbit, but separated from it above and below, with posterior lobe not prolonged far back, and with a space between its lower margin and the opening of the jaw. Cleft of mouth oblique and curved, the maxillary reaching to angle of preoperculum and not dilated. Origin of dorsal and ventral nearly in same vertical, that of former midway between anterior margin of orbit and adipose fin; that of latter midway between tip of snout and adipose fin. Insertion of the last ray of dorsal is over interspace between third and fourth rays of anal. Pectoral (unless mutilated) only half as long as ventral, and its tip does not approximate the vertical from its origin. Dorsal and anal similar, the former with its upper margin concave. Adipose dorsal inserted over interspace between antepenultimate and penultimate anal rays, and as long as ultimate dorsal ray. Scales smooth, those of lateral line scarcely enlarged.

In the type there are thirteen photophores in the anal series; a wide break over the roots of the last two rays of the anal fin. No posterolaterals. Two mediolaterals, the anterior the lowest. Two anterolaterals, the anterior and highest very small, above the axil of the pectoral or very near the lateral line, the posterior one somewhat more than midway between this and the anterior of the mediolateral group, and forming, with the two photophores in that group, an obtuse isosceles triangle, with the anterior of the medial group at its apex. Of the four precaudal photophores the last three are the most nearly together, and form a nearly vertical line at the base of the lower caudal lobe. There is a large, apparently luminous, pearl-colored spot under the tip of the flap of the operculum.

Radial formula: D. III, 14; A. II, 14; L. lat. 35.

A single specimen (Cat. No. 44084, U. S. N. M.), about 4 inches long, was obtained by the *Albatross* at station 2127, in 19° 45′ N. lat., 75° 04′ W. lon., 1,639 fathoms.

ÆTHOPRORA EFFULGENS, Goode and Bean, n. s. (Figure 103.)

Height of body one fourth of total length, length of head slightly greater. Least depth of tail one-half height of body. Head considerably longer than high, the flap of operculum extending above and behind axil of pectoral. Eye large, diameter contained 2½ times in length of head. Snout exceedingly short and obtuse, as in *A. metopoclampa;* the luminous organ enormous, gland-like, overlapping entire anterior margin of orbit, extending down upon edge of jaw and extending backwards almost as far as in *A. metopoclampa.* Cleft of mouth oblique, somewhat curved, the maxillary reaching nearly to angle of preoperculum. Origin of dorsal somewhat in advance of vertical from that of ventral, which touches root of second dorsal ray. Last dorsal ray over roots of short spines preceding anal. Insertion of ventrals considerably posterior to a point equidistant from root of adipose dorsal and anterior margin of the orbit. Origin of adipose dorsal over interspace between antepenultimate and ultimate anal rays. Pectoral stout and much shorter than ventral, not reaching much more than half way to its root. Scales smooth, those in the lateral line somewhat enlarged, shiny, and conspicuous; the lateral line descending in a gentle catenary curve to a point above the origin of the ventral. The arrangement of the photophores is very peculiar, and can best be understood by an examination of the figure. There is a break in the series of superanals, there being five on the lower part of the caudal peduncle behind the extremity of the anal. There are apparently two posterolaterals, the posterior and highest near the lateral line, and forming the beginning of a series of 8, arranged in the arc of a circle, the last being the highest in the group of mediolaterals, of which there are 4. There is but one anterolateral, which is above the axil of the ventrals, slightly behind it and about midway between it and the lateral line. There is a large, triangular, luminous patch in the space between the axil of the pectoral and the flap of the operculum, which covers its anterior portion, and is itself decorated with a circular photophore. There appears to be a luminous patch along the anterior margin of the preoperculum.

Radial formula: D. II, 13; A. II, 14; L. lat. 35–36.

A single specimen (Cat. No. 43770, U. S. N. M.) was taken from the stomach of a cod captured by the schooner *Joseph O.*, of Gloucester, on Brown's Bank; another by the *Albatross* from Station 2127, in 19° 45′ N. lat., 75° 04′ W. lon., at a depth of 1,639 fathoms.

COLLETTIA, Goode and Bean, n. g.

Myctophids, similar in form to *Aethoprora*, with a pair of luminous bands on the anterior part of the head and another on each side in the hollow of the first infraorbital bone. Scales of lateral line somewhat enlarged. Type, *Myctophum Rafinesquii*, Cocco.

COLLETTIA RAFINESQUEI, (Cocco), Goode and Bean. (Figure 100.)

Nyctophus Rafinesquii, Cocco, Alcuni Salmon., etc., 1820, sp. 1, tab. III, fig. 7.—Bonaparte, Faun. Ital., fasc. XXXVII, pl. 120, fig. 2.

Scopelus Rafinesquii, Günther, Cat. Fish. Brit. Mus., v. 1864, 410.—Giglioli, Elenco, 100.—Raffaele, Mitt. Zool. Stat. Naples, IX, 183, pl. VII, fig. 7.

A *Myctophum* with a stout, short body, moderately compressed; with a rounded, blunt snout, very large mouth, comparatively small eye; comparatively short, triangular dorsal and anal, the former entirely in advance of the latter and inserted very far forward.

Height of body 4 times in total length; length of head 3 times. Depth of body one-fourth of total length. Caudal peduncle stout; its height nearly one-half height of body. Eye moderately large, its diameter contained $2\frac{2}{3}$ times in length of head; distance between posterior margin of orbit and preopercular edge one-half diameter of eye. Snout very short, obtuse, keeled, with profile abruptly declivous; its length one-third of diameter of eye. Cleft of mouth slightly oblique, the lower jaw received within the upper.

Mouth rather large, the maxillary extending to angle of preoperculum and behind orbit a distance equal to two-thirds diameter of eye; its posterior extremity not dilated, and entirely concealed under the scales of the cheek. Origin of dorsal over that of ventral, considerably nearer to tip of snout than to root of caudal; its last ray in advance of origin of anal. Ventral stout and long, reaching to origin of anal. Pectoral small, reaching to root of ventral. Anal origin under the twelfth scale of lateral line; its last ray is directly under adipose dorsal. Scales in lateral line, somewhat enlarged, luminous.

Anterolaterals, 4, very irregular, the three posterior ones forming an isosceles triangle, as in *Æthoprora metopoclampa.* Mediolaterals, 3, arranged much as in *Myctophum punctatum.* Posterolaterals, 2, arranged much as in *A. effulgens* (perhaps only one posterolateral, if the photophore immediately below it should be recognized as belonging to the superanal series). Superanals in two groups; 5 or 6 in the first; 4 in the last. Precaudals, 4, in nearly straight line, the last and uppermost at or near extremity of lateral line, the others descending forward at an angle of approximately forty-five degrees with axis of body. Radial formula: D. 12; A. 15; L. lat. 32–35.

This species, first described by Cocco from the Mediterranean, is abundant about Sicily, but has never before been found in the Atlantic. The descriptions of Cocco and Bonaparte were too general for use in comparison, also that of Günther, being founded upon a small number of very minute specimens, especially as it has few rays in the anal and the proportions of the head and eye peculiar to very young specimens.

It is with peculiar pleasure that we add to the fauna of America a species identified with the name of Rafinesque, who was the first to call attention to the genus to which it belongs. The three specimens (No. 33550, U. S. N. M.) described by us, the largest of which is 77 millimeters long, with imperfect tail, were taken by the steamer *Albatross* in 37° 12′ 20″ N. lat., 69° 39′ W. lon. These have been studied in connection with ample material from Messina (No. 40058, U. S. N. M.), received from the Florence Museum.

DIAPHUS, Eigenmann.

Diaphus EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci., 2d ser., III, 1890, 3.

Myctophids, similar in form and proportions to the typical genus of the family, though stouter, with a very much wider and less oblique mouth, pectoral placed lower, and with opercular apparatus much more obliquely articulated. Dorsal and anal similar, not touching the same vertical. The glandular photophore in front of each eye below the nostril, and the pearl-like photophores upon the sides divided into halves by a septum of black pigment. No caudal photophores. Postlaterals, 2, in obliquely ascending row.

The type of this genus is *Diaphus theta*, Eigenmann and Eigenmann, *loc. cit.*, from moderate depths off Point Loma, near San Diego, Cal. (Figure 93.)

Scopelus engraulis, Günther (Challenger Report, XXII, 197, pl. LI, fig. c), from 250 fathoms off the Philippines, is referred to the same group by Eigenmann.

TARLETONBEANIA, Eigenmann.

Tarletonbeania, EIGENMANN and EIGENMANN, Proc. Cal. Acad. Sci. (2d ser.) iii, 7, (1890).

Myctophid fishes, having dorsal and anal fins considerably overlapping, the base of the anal much longer than that of the dorsal. Lateral line obsolescent. Head long, with oblique opercular limb. Pectoral very high. No luminous glands. Photophores much as in typical genus, but none to be detected upon the head. One precaudal photophore.

The type of this genus, *T. tenua*, Eigenmann, *loc. cit.* from near the Coronado Islands (Fig. 105), and *M. crenulare*, of Jordan and Gilbert, are both Pacific forms.

RHINOSCOPELUS, Lütken.

Alysia, LOWE, Proc. Zoöl. Soc. London, 1839, 87; Trans. Zoöl. Soc. London, III, 14.
Rhinoscopelus, LÜTKEN, Vid. Selsk. Naturv. Copenhagen, VII, 1892, 237.

Body oblong, slender, compressed, with slender and elongate caudal peduncle covered with smooth, stiff scales, those in the lateral line much longer than the others. Head compressed; cleft of mouth very wide; the jaws about equal. The premaxillary long and slender; maxillary well developed, reaching nearly or quite to the angle of the preoperculum, without considerable posterior dilation. Teeth in villiform bands in the jaws, on the palatines, pterygoids, and tongue. Eye moderate, its diameter less than one-third of the length of the head. Gill rakers very long and slender. Dorsal fin premedian; pectoral large; adipose dorsal small. Anal fin longer than dorsal. Pectoral narrow, elongate.

Precaudals, 2. Superanals about 18, in two groups, the break being over the middle of the long anal fin and at the end of the first third of the series, approximately. Anterolaterals, 1 or 2; mediolaterals, 2 or 3; posterolaterals, 1.

Myctophum coruscans of Richardson, from South Atlantic and Australian oceans, is supposed to belong to this genus.

RHINOSCOPELUS COCCOI (Cocco), LÜTKEN. (Figure 104.)

Scopelus Cocco, Cocco, Giorn. Sci. Litt. Art. Sicilia (No. 77). Palermo, 1829, 143 ("Scopelo de Cocco") Alcuni Salmonidi del Mare de Messina (Nuovi Ann. Sci. Nat.), 1838, 18, Pl. II, Fig. 6.—BONAPARTE Fauna Italica, Pesci. fasc. XXVII, Pl. 1840.

Scopelus Coccoi, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 413; Challenger Report, XXXII, Pelagic Fishes, 30.—GIGLIOLI, Elenco, 100.

Alysia loricata, LOWE, Proc. Zoöl. Soc., 1839, 87; Trans. Zoöl. Soc. III, 14.

Height of body 4½ (perhaps in females) to 5 in total length. Length of head contained rather more than 5 times in length (without caudal). Tail slender, elongate, its least depth one-fourth of the height of the body. The diameter of the eye is contained 4 times in the length of the head. Distance between the posterior margin of the orbit and the preopercular edge is two-thirds of the diameter of the eye. Preopercular edge obliquely descending backwards. Snout conical, the upper part projecting beyond the lower, the upper and lower profiles nearly equally curved. The maxillary extends to the angle of the preoperculum and is scarcely dilated. The dorsal origin is nearer to the end of the snout than to the root of the caudal, and behind the base of the ventral; the last ray of the dorsal is in the vertical from the second or third anal ray. Pectoral extends to the middle of ventral.

In some specimens each of the scales on the back of the tail has a pearl-colored dot; this is probably a sexual character of the male. The back and the nape are blackish; sides silvery, with gold and silver reflections. The inside of the mouth is blackish, the iris silvery, the pupil transparent. Radial formula: D. 10–12; A. 20–21; V. 8; 1 | 41 | 3.

This species, although said to be very rare in the Mediterranean, would appear to be one of the most abundant of the surface forms in the Western Atlantic, for many hundreds of specimens have been obtained by the *Albatross* at the surface, often from twenty to fifty in a single locality taken with a dip net; sometimes by electric light after dark.

Specimens of this species were obtained by the *Albatross* from the following localities: No. 43817, U. S. N. M., from station 2381, in 28° 05′ N. lat., 87° 56′ 14″ W. lon., at a depth of 1,330 fathoms; No. 43814, U. S. N. M., at the surface at station 2569, in 39° 26′ N. lat., 68° 03′ 30″ W. lon., at a depth of 1,782 fathoms; Nos. 43820, 43821, and 43822, U. S. N. M., taken in a towing net on September 19, 1885, in 39° N. lat. 72° W. lon. (two of the individuals appear to have been nearing the spawning time); numerous specimens (No. 38191, U. S. N. M.), in 36° 45′ N. lat., 74° 28′ 30″ W. lon.; No. 43813, U. S. N. M., from station 2571, in 40° 09′ 30″ N. lat., 67° 09′ W. lon., taken at the surface in a tow net; No. 43818, U. S. N. M., from station 2573, in 40° 43′ 18″ N. lat., 66° 09′ W. lon., in 1,742 fathoms; No. 43812, U. S. N. M., from station 2566, in 37° 23′ N. lat., 68° 08′ W. lon., at a depth of 2,620 fathoms; at the surface from station 2285, in 35° 21′ 25″ N. lat., 70° 24′ 25″ W. lon., at a depth of 13 fathoms; No. 43816, U. S. N. M., at the surface at station 2584, in 39° 05′ 30″ N. lat., 70° 23′ 20″ W. lon., at a depth of 541 fathoms; No. 43819, U. S. N. M., from station 2522, in 42° 20′ N. lat., 65° 07′ 30″ W. lon., at a depth of 104 fathoms; No. 38171, U. S. N. M., from station 2724, in 36° 47′ N. lat., 73° 25′ W. lon., at a depth of 1,641 fathoms; No. 43823, U. S. N. M., from station 2727, in 36° 35′ N. lat., 74° 03′ 30″ W. lon., at a depth of 1,239 fathoms; and No. 43824, U. S. N. M., from station 2724, in 36° 47′ N. lat., 73° 25′ W. lon., at a depth of 1,641 fathoms. The British Museum has it from the Gulf of Guinea and the Congo expeditions. Lowe's Madeira types are at Cambridge in the Museum of the Philosophical Society.

Additional specimens (No. 43825, U. S. N. M., No. 4, Gloucester Donations) were taken by the Gloucester fishing vessels on the Fishing Banks. The U. S. frigate *Constitution* (Dr. W. H. Jones) obtained several from lat. 31° 30′ N., lon. 68° 36′ W.

RHINOSCOPELUS ANDREÆ, LÜTKEN.

Scopelus (*Rhinoscopelus*) *Andreæ*, LÜTKEN, Spolia Atlantica, 245, fig. 3.

A species closely resembling *S. Coccoi*, in form, but having a single anterolateral photophore, placed much as in *S. Coccoi*, and three posterolaterals in an obliquely vertical row, arranged as in *Myctophum punctatum*. Pectoral fin long, falcate, passing far beyond the anterolateral photophore and considerably beyond the vertical from the origin of the dorsal.

Lütken had numerous specimens from the following localities: N. lat. 42°, W. lon. 12° 54′; N. lat. 35° 22′–36° 22′, W. lon. 41° 37′–48° 48′; N. lat. 29° 31′, W. lon. 34° 33′; N. lat. 29°, W. lon. 34°; N. lat. 28°, W. lon 36°; N. lat. 22° 16′, W. lon. 78°; N. lat. 22° 12′ W. lon. 28° 48′; N. lat 20°, W. lon. 48°–50°; N. lat. 19°–19° 30′, W. lon. 26° 5′–26° 10′; N. lat. 15° 19′, W. lon. 24° 54′; N. lat. 14° 46′ W. lon. 28°; S. lat. 4° 20′, W. lon. 14° 20′; S. lat. 8°, W. lon. 13° 20′; S. lat. 24° 30′, W. lon. 28° 30′; S. lat. 25° 4′, W. lon. 27° 26′; S. lat. 33° 30′, W. lon. 11°; S. lat. 5° 21′, E. lon. 81° 56′; S. lat. 15° 35′, E. lon. 109° 20′; S. lat. 16°, E. lon. 110° 20′; S. lat. 23° 40′, E. lon. 57° 40′; S. lat. 23° 30′, E. lon. 81°; S. lat. 24° 30′, E. lon. 75° 50′; S. lat. 27° 40′ E. lon 58° 30′; S. lat. 28° 16′–30°, E. lon. 97° 30′–96°; S. lat. 29° 54′, E. lon. 76° 42′; S. lat. 32° 15′, E. lon. 58° 30′; S. lat. 38°; and since examining his paper, we find them not uncommon in the collection of the National Museum, mingled with the specimens identified by us with *S. Coccoi.* It occurs in almost every lot, and therefore a new list of localities is not given. It seems not impossible the form may eventually be found to be a sexual variation of *S. Coccoi.*

RHINOSCOPELUS RARUS, LÜTKEN.

Scopelus (Rhinoscopelus) rarus, LÜTKEN, Spolia Atlantica, II, 1892, 246, fig. 4.

This species, described by Lütken, seems to differ from the other species of this genus in many important particulars, and but for the unquestioned accuracy and thorough insight which this authority has always manifested, an inspection of the figure would lead us to question whether it properly belongs here. The peculiar arrangement of the photophores, and the presence of a luminous plate upon the top of the caudal peduncle distinguish it at once from all the others, as well as does the shape of the body, which is more like that of *Myctophum*, the short anal fin, the overlap of the dorsal with the anal, and the comparative shortness and thickness of the caudal peduncle, and also the nearly vertical direction of the preopercular limb. The most characteristic feature in the arrangement of the photophores is the almost entire absence of the postventral series and the number of photophores in the superanal series, comparatively much smaller than in *S. Coccoi.*

ELECTRONA, Goode and Bean, n. g.

Myctophids having dorsal and anal fins slightly overlapping. The lateral line with scales much enlarged; scales hard, persistent. Luminous gland on top of the caudal peduncle, but none on head. Anal longer than dorsal, and passing behind the vertical from soft dorsal. Body ovate, compressed; head short; profile declivous; snout not projecting. Caudal peduncle short and stout. No posterolateral photophore. (Type, *Scopelus Rissoi*, Cocco.)

ELECTRONA RISSOI (COCCO), GOODE and BEAN. (Figure 107.)

Scopelus rissoi, COCCO, Giorn, Sicil., fasc. 77, 144; Lett. su Salmon., 15, Pl. 2, fig. 5.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 446.—GÜNTHER, Cat. Fish. Brit. Mus., V, 405.

No description is necessary of this well known species, but for the first time is presented a good figure of a specimen sent to the National Museum by the Royal Museum in Florence.

We are greatly in doubt as to the relationships of this form, but it is provisionally placed near *Rhinoscopelus* on account of the resemblance in the scales.

DASYSCOPELUS, Günther.

Dasyscopelus, GÜNTHER, Cat. Fish. Brit. Mus. V., 1864, 405, 411.

Myctophid fishes, having the dorsal and anal fins touching the same vertical, but not overlapping; somewhat emarginate. Scales of lateral line much enlarged, hard, persistent, ctenoid. Anal terminating below soft dorsal. Body elevated, somewhat compressed. Caudal peduncle rather slender; luminous scales on the back of the caudal peduncle. The arrangement of the photophores much as in *Myctophum*: 2 anterolaterals; 2 mediolaterals; one posterolateral, far in advance of the break in the anal series, 2 precaudals, the last at the end of the lateral line.

The type of this genus is *Scopelus asper* and Günther assigns to it also *S. subasper*, from the Pacific. (For *D. spinosus*, Steindachner, see Appendix).

DASYCOPELUS ASPER (RICHARDSON). (Fig. 106.)

Myctophum asperum, RICHARDSON, Voy. Ereb. and Terr., Ichth,, 41, Pl. XXVII, Fig. 105.
Scopelus asper, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 454.—GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 411.

The height of the body is one-fourth of the total length (without caudal), the length of the head two-sevenths; the least depth of the tail is one-third of the height of the body; the depth of the head is contained 1¼ times in its length. Eye very large, two-fifths of the length of the head; distance between the posterior margin of the orbit and the preopercular edge equal to one-third of the diameter of the eye; posterior margin of the preoperculum vertical. Snout extremely short and obtuse, with its upper profile abruptly bent downwards. Cleft of the mouth nearly horizontal with the lower jaw received within the upper. The maxillary reaches nearly to the angle of the preoperculum, and is gradually and slightly dilated behind. The origin of the dorsal fin is considerably nearer to the extremity of the snout than to the root of the caudal, and immediately behind the base of the ventral; its last ray is a little before the origin of the anal. The pectoral extends to the middle of the ventral, which is the shorter. Scales with the margins strongly serrated; those of the lateral line are much larger than the others. Some of the adult specimens have a pearl-colored matter imbedded in the substance of the scales on the back of the tail. (*Günther.*)

Radial formula: D. 13; A. 20; V. 8; scales 2 | 37 | 3.

The British Museum preserves the types of the species, obtained by the *Erebus* and *Terror* at New Ireland, and also others from the Gulf of Guinea.

DASYSCOPELUS SPINOSUS (STEINDACHNER).

Scopelus spinosus, STEINDACHNER, LÜTKEN, Spolia Atlantica, II, 1892, 239, pl. I, fig. 2.

A species described and figured by Lütken, of which he had a number of specimens from the Atlantic from the following localities: N. lat. 14° 11′, W. lon. 29° 32′; N. lat. 9°, W. lon. 22°; N. lat. 6°, 22′, W. lon. 22°; N. lat 5° 31′, W. lon. 23° 15′; N. lat. 4°, W. lon. 24°; N. lat. 3° 10′, W. lon. 20° 30′; N. lat. 3° 10′, W. lon. 27° 50′; N. lat. 3° 9′, W. lon. 23°, 11′; S. lat. 0° 04′, W. lon. 25°; S. lat. 2° 30′, W. lon. 16° 4′; N. lat. 2°, W. lon. 31° 30′; and S. lat. 7° 6′, W. lon. 7° 30′, as well as others from the central Pacific. It differs from *D. asper* chiefly in the character of the lateral line, which in Richardson's figure of *D. asper* has the scales very much enlarged. The arrangement of the photophores is much the same.

DASYSCOPELUS SUBASPER (GÜNTHER).

Scopelus subasper, GÜNTHER, Cat. Fish. Brit. Mus., V. 411.—LÜTKEN, Spolia Atlantica, II, 1892, 240, fig. 1.

Günther described this species from the Pacific Ocean (lat. 73° 30′ S. lon. 123° E.) and Lütken identifies from the Atlantic a species under this name, which he distinguishes from the others by the absence of the break in the superanal series of photophores, the absence of the posterolateral photophore, the arrangement of the anterolaterals and mediolaterals in groups of two each, and also a peculiarly inverted triangular patch of the prepectorals.

NEOSCOPELUS, Johnson.

Neoscopelus, JOHNSON, Proc. Zoöl. Soc. Lond., 1863, 44.—GÜNTHER, Cat. Fish. Brit. Mus., V. 405 (as subgenus).

Oblong, compressed, covered with large caducous scales. First dorsal placed over the abdominal ventral fins. The pectoral fins long; their inferior rays not thicker than the rest. Mouth-cleft not extending beyond eyes. The maxillary dilated below and furnished with a small supplementary piece. The upper border of the mouth formed entirely of the premaxillary; scobinate bands of teeth in both jaws, on the palatine bones, and on the vomer; scobinate patches of teeth on the entopterygoids.

NEOSCOPELUS MACROLEPIDOTUS, JOHNSON. (Figures 108-109.)

Neoscopelus macrolepidotus, JOHNSON, Proc. Zoöl. Soc., 1863, 44, pl. 7; ALCOCK, Ann. and Mag. Nat. Hist., 1891, II, 129.
Scopelus macrolepidotus, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 414.

Height of the body is a little more than one-fourth of total length (without caudal), length of head one-third. Eye of moderate size, one-fifth of length of head, and equal to width of interorbital space, and to distance between its posterior margin and preopercular edge. Snout conical, longer than eye, with lower jaw rather prominent. Maxillary reaches only to vertical from posterior margin of eye, and is much dilated behind. Origin of dorsal before root of ventral, nearer to extremity of snout than to root of caudal. Pectoral fin long, extending nearly to vent. Posterior margin of each scale covered with minute spines, but the margin itself is not serrated.

Radial formula: B. 9; D. 13; A. 13; V. 8; L. lat. 3 | 30 | 5.

The type of this species is a single specimen, 9½ inches long, in the British Museum, obtained off Madeira in January, 1863. The *Albatross* obtained a specimen on February 11, 1885, from station 2376, in 29° 03′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms. The *Blake* obtained two specimens, one off Dominica, in 333 fathoms, and one from Station XLII, off Martinique, in 357 fathoms. The French expedition obtained it from off the coast of Morocco, 1,350 and 1,590 meters. The *Investigator* took it in the Indian Ocean in 188-220 fathoms.

The color of the *Albatross* specimen, as noted immediately after capture by Dr. Bean, was as follows: Grayish silver on sides, with narrow margins of claret red on the scales (or scale impressions). All the fins with brick-red on membrane covering the rays. Iris, pale gold. Preoperculum and interopercle with narrow lines of red. Bone supporting branchiostegal rays with a broad iridescent band. Phosphorescent spots on throat, also iridescent. Each phosphorescent spot on lower surface pale gold, iridescent, and with a narrow, dark brown margin posteriorly. Iris with a claret blotch or blotches.

SCOPELENGYS, Alcock.

Scopelengys, ALCOCK, Ann. and Mag. Nat. Hist., 1890, II, 303.

Head and body compressed. Eye small. Mouth very wide; the maxilla dilated behind. Acute villiform teeth, in bands uncovered by the lips in the jaws, and in the palatines and vomer. Gill openings very wide; gill covers complete. Pseudobranchiæ rudimentary. Dorsal fin near the middle of the body short; an adipose dorsal. Anal fin short. Caudal forked. Pectorals well developed. Ventrals with 8 rays. (Scales, if present, very deciduous.) No air bladder. Pyloric cæca present in moderate number.

The type is *S. tristis*, obtained by the *Investigator* at station 104 in the Arabian Sea, at a depth of 1,000 fathoms.

NANNOBRACHIUM, Günther.

Nannobrachium, GÜNTHER, Challenger Report. XXII, 1887, 199. (Type, *N. nigrum*, pl. LII, fig. b., from the Indian Ocean, 500 fathoms.)

Body elongate, compressed, with large deciduous scales. Mouth wide, with well developed maxillary, not dilated posteriorly. Teeth in jaws, on vomer, palatines, and tongue in narrow bands and very small. Eye moderate. Pectoral fins rudimentary. Ventrals normal, 8-rayed, inserted behind pectorals. Dorsal fin median, with 13 or 14 rays, its origin in the interspace between ventral and anal. Anal moderate. Caudal forked or emarginate. Adipose fin small, above end of anal. Gill openings extensive. Pseudobranchiæ small. Phosphorescent organs in rows along lower parts, and numerous others on the base of the tail, above and below.

NANOBRANCHIUM MACDONALDI, Goode and Bean, n. s. (Figure 110).

Height of body contained 5 in total length; head 3½ times. Eye moderate, its diameter contained 5 times in length of head, and considerably greater than that of snout. Mouth extremely wide; rather oblique; with lower jaw somewhat projecting, extending backwards to end of preoperculum. Intermaxillary as long as maxillary, toothed throughout its entire length; both bones narrow and rod-shaped. Gill laminæ very short; gill rakers long, needle-shaped, the longest a little longer than eye. Origin of dorsal nearer extremity of snout than root of caudal, its last ray opposite fourth or fifth ray of anal, while the origin of anal is opposite tenth ray of dorsal; the longest ray of the latter equal to length of head without snout. Adipose fin small, opposite penultimate ray of anal. Caudal much forked. Pectoral composed of three or four small, short, delicate rays. Ventral inserted slightly in advance of dorsal, and extending to vent. Phosphorescent organs arranged much as in *N. nigrum*. The glandular organ of white upon the top of the caudal peduncle is much smaller than that described for *N. nigrum*, but has possibly been partially obliterated; the one on the lower part of the peduncle is much larger. Coloration, purplish brown.

Radial formula: D. 13; A. 16—17; Scales 4 | 35 | 4.

Nannobranchium McDonaldi is dedicated to the United States Commissioner of Fisheries. It appears clearly distinguished from *N. nigrum*, Günther, obtained by the Challenger south of the Philippine Islands, at a depth of 500 fathoms. This species is described from a single specimen (No. 39478, U. S. N. M.) 5 inches in length, obtained by the *Albatross* from station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms.

In an individual (No. 49481, U. S. N. M.), taken by the *Albatross* from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., the pectoral is much more developed than in any of the types, its length being two-fifths that of the head, and reaches nearly to origin of ventral.

Other specimens were taken by the *Albatross* as follows: No. 35445, U. S. N. M., 6¼ inches in length, was taken from station 2182, in 39° 25′ 30″ N. lat., 71° 44′ W. lon., at a depth of 861 fathoms; a specimen from station 2103, in 38° 47′ 20″ N. lat., 72° 37′ W. lon., at a depth of 1,091 fathoms; a specimen 4½ inches in length, from station 2379, in 28° 00′ 15″ N. lat., 87° 42′ W. lon., at a depth of 1,467 fathoms; No. 28840, U. S. N. M., 2¾ inches in length, from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; six specimens, the largest of them 5½ inches in length, from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1,022 fathoms; specimens from 37° 20′ 42″ N. lat., 74° 17′ 36″ W. lon., and 39° 57′ N. lat., 69° 16′ W. lon., and from station 2680, in 39° 50′ N. lat., 70° 26′ W. lon., at a depth of 535 fathoms; and station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; No. 32666, U. S. N. M., from station 2003, in 37° 16′ 30″ N. lat.. 74° 26′ 36″ W. lon., at a depth of 641 fathoms; No. 35539, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; No. 35616, U. S. N. M., from station 2201, in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms; No. 35557, U. S. N. M., from station 2204, in 39° 30′ 30″ N. lat., 71° 44′ 30″ W. lon., at a depth of 728 fathoms; No. 35411, U. S. N. M., 110 millimeters in length, from station 2181, in 39° 29″ N. lat., 71° 46″ W. lon., at a depth of 693 fathoms; and a specimen, 106 millimeters in length, from station 2102, in 38° 44″ N. lat., 72° 38″ W. lon., in 1,209 fathoms; from station 2,530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., in 956 fathoms.

SCOPELOSAURUS, Bleeker.

Scopelosaurus, BLEEKER, citation.

This genus stands far apart from all the others in the family, having a cylindrical body, with small scales, median dorsal, and teeth in the lower jaw in several series. It is represented by a single species, *S. Hoedti*, Bleeker, from Amboyna, and it is not known whether or not it is abyssal in its habits.

Family MAUROLICIDÆ.

Coccilina, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 387 (group under *Sternoptychidæ*).
Maurolicidæ, GILL (MS.).

Body somewhat elongate, compressed, scaleless. Barbels none. Margin of the upper jaw formed by the maxillary and intermaxillary, both of which are provided with teeth. Opercular apparatus incomplete. Gill opening very wide, the outer branchial arch extending forward to behind the symphysis of the lower jaw. Pseudobranchiæ present. Air bladder none. Adipose fin rudimentary. Series of luminous phosphorescent spots along the lower side of the head, tail, and body. A single dorsal fin, without spinous rays. The remarkable form *Opisthoproctus*, Vaillant (fig. 112), perhaps belongs here.

KEY TO THE GENERA.

I. Gill rakers very short, dorsal fin nearly in middle of length of body .... ICHTHYOCOCCUS
II. Gill rakers very long, dorsal fin on hinder half of body .... MAUROLICUS

ICHTHYOCOCCUS, Bonaparte.

Ichthyococcus, BONAPARTE, Faun. Ital., Pesci, Fasc. XXVII, 1840.
Coccia, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 387.

Body compressed, naked, silvery; phosphorescent bodies upon the lower parts. Mouth moderate. Maxillary bones dilated, forming nearly the entire margin of the upper jaw; intermaxillaries small; lower jaw included. Teeth inconspicuous, a few near the symphysis of the lower jaw, while the edge of the maxillary is finely serrated. Eyes moderate in size, separated by a very narrow interorbital area. Pectorals placed very low. Ventrals present. Dorsal nearly median. Adipose fin rudimentary. Anal moderate. Caudal forked. Gill opening extensive, outer branchial arch reaching to behind the symphysis of the lower jaw, with numerous short gill rakers.

The recent tendencies of opinion among American zoölogists are not in accord with the action of Dr. Günther in substituting *Coccia* for *Ichthyococcus.*

ICHTHYOCOCCUS OVATUS (Cocco), BONAPARTE. (Figure 113.)

Gonostomus ovatus, COCCO, Lett. su Salmoni, 9, pl. I, fig. 3.
Ichthyococcus ovatus, BONAPARTE, Faun. Ital., Pesci, Fasc. XXVII, 1840, figure.—VAILLANT, Exp. Sci. Travailleur et Talisman, 104, pl. XIV, fig. 2, 2a.
Scopelus ovatus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., 453.
Coccia ovata, GÜNTHER, Cat. Fish. Brit. Mus., v, 388.

This form, known since the days of Bonaparte, from the Mediterranean, was obtained by the French explorers in 1882 off the coast of Portugal at 950 meters, and off Morocco at 2,030 meters. It has not yet been found in the western Atlantic.

MAUROLICUS, Cocco.

Maurolicus, COCCO, Lett. s. Salmoni, 32 (type, *Maurolicus amethystino-punctatus*, Cocco).—GÜNTHER, Cat. Fish. Brit. Mus., v, 388.

Body oblong, compressed, naked, covered with silvery pigment; phosphorescent spots along the lower parts. Head compressed, with bones thin, but ossified. Cleft of mouth wide, oblique, lower jaw slightly prominent. Maxillary large, broad, much produced backwards, receiving the slender premaxillary in the upper concave part of its margin. Both jaws with minute teeth. Gill opening very wide. Gill rakers very long. Pectorals and ventrals developed. Dorsal on hinder half of body, but before anal. Adipose fin rudimentary. Anal fin long, in two portions, the posterior half with its rays hidden beneath the skin. Branchiostegals, 8 or 9. (Abridged from Günther.)

MAUROLICUS BOREALIS, (NILSSON), GÜNTHER. (Figure 111.)

Scopelus borealis, NILSSON, Observ. Zool., 9.
Maurolicus borealis, GÜNTHER, Cat. Fish. Brit. Mus., v, 389.
Scopelus Humboldti, DE KAY, N. Y. Fauna, Fish., 246. (Not of Cuvier.) STORER, Hist. Fish. Mass., 328.

Body compressed. Mouth wide, the lower jaw much projecting. Teeth small. Eye large, 3 in head. Five luminous spots on the throat, 12 between pectorals and ventrals, above these a row of 8, 5 between ventrals and anal, vent to tail 24. Dorsal nearer tail than snout. Adipose fin very small. Ventrals below dorsal. Caudal forked. Color: dark greenish, sides silvery.

Head, 3½; depth, 3¼. Radial formula: D. 10; A. 15.

A specimen of this species was picked up on the beach near Provincetown in August, 1879, by Dr. Bean. It had previously been found off the coasts of Great Britain and Scandinavia.

Specimens were obtained by the *Albatross* from station 2402, in 28° 36′ N. lat., 85° 33′ W. lon., at a depth of 111 fathoms; and No. 29000, U. S. N. M., from station 1044, in 38° 37′ N. lat., 73° 12′ W. lon., at a depth 224 fathoms. A specimen was also received by the National Museum from Woods Holl, Massachusetts.

Family CHAULIODONTIDÆ.

Chauliodontina, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 391, 392 (group under *Sternoptychidæ*).
Chauliodontidæ, BONAPARTE, Catologo Metodico, 1846, 5.—GILL, Arrangement Families of Fishes, 1862, 15.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 284.

Body oblong or elongate, compressed, covered with rather large, thin, deciduous scales, Lateral line present. No barbels. Series of phosphorescent spots running along the lower side of the head, body, and tail. Head much compressed, the bones thin, but ossified. Mouth with the cleft extremely wide, its margins formed by maxillaries and premaxillaries, both of which are provided with teeth. Teeth unequal, some of them long and pointed, fang-like. Pectorals and ventrals well developed. Adipose fin present. Caudal forked. Gill openings very wide. No pseudobranchiæ.

CHAULIODUS, Schneider.

Chauliodus, SCHNEIDER, Bloch, Systema Ichthyologiæ, 1801, 430.—GÜNTHER, Cat. Fish. Brit. Mus., v, 392.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 284.

Body elongate, compressed, covered with very thin, deciduous scales of moderate size. Head short, much compressed and elevated, the lower jaw projecting, the snout much shorter than eye. Mouth extremely wide, the cleft reaching much beyond eye. Premaxillaries attached to spine with 4 long, fang-like canines on each side. Mandible with pointed, wide-set teeth, the anterior ones excessively long; none of these large teeth received within the mouth. Maxillaries with fine teeth; palatine with a single series of small, pointed teeth; no teeth on the tongue. Eye moderate. Pectorals moderate. Ventrals large. Dorsal fin high, placed anteriorly, well in front of the ventrals. Adipose fin moderate, sometimes fimbriate, opposite the low, short anal. Caudal moderate, forked. Gill openings very wide. No pseudobranchiæ. No gill rakers. Branchiostegals numerous. (*Jordan* and *Gilbert.*)

The question of the presence or absence of the air bladder having never been investigated, a dissection by Dr. Bean has revealed the presence of a conspicuous but thin-walled organ. The specimen (No. 35626, U. S. N. M.) taken by the *Albatross* shows long, slender ovaries, with small but perfectly distinct eggs.

C. pammelas, Alcock (Ann. & Mag. Nat. Hist. 1892, II, 355) is from the Indian Ocean, *Investigator* and station 126, 1,310 fathoms. It is close to *C. Sloani.*

CHAULIODUS SLOANI, SCHNEIDER. (Figure 115.)

Chauliodus Sloani, SCHNEIDER, Bloch's, Systema Ichthyologiæ, 1801, 430.—CUVIER & VALENCIENNES, Hist. Nat. Poiss., XXII, 383.—GÜNTHER, Cat. Fish. Brit. Mus., v, 392; Challenger, XXII, 179.—ALCOCK, Bathybial Fishes of Bay of Bengal, 1889, 25; Ann. and Mag. Nat. Hist., 6th Ser. VII, 11; 1891, II, 127; 1892,

II, 355.—GOODE, Proc. U. S. Nat. Mus., III, 483.—COLLETT, Bull. Soc. Zool., France, XV, 1890, 223.—VAILLANT, Exp. Sci. Travailleur et Talisman, 102.
Chauliodus setinotus, SCHNEIDER, *l. c.*, pl. LXXXV.—BONAPARTE, Faun. Ital., Pesc., fig.
Chauliodes Schneideri, RISSO, Hist. Nat. Eur. Mérid., III, 442, fig. 37.

Dorsal not far behind head, its first ray produced in a long filament. Pectoral fins short. Ventral fins elongate, longer than head. About 30 phosphorescent dots in a series from the chin to the ventrals. Scales of the body subhexagonal. Head nearly as deep as long, 7 in total length; depth about same. (*Günther.*)

Radial formula: B. 17; D. 6; A. 12; V. 7; Lat. l. 56.

Greenish above; sides silvery; belly blackish.

This species has been obtained in the Mediterranean, off the coast of Morocco in 560 fathoms by the French; at Madeira (Collett); in the Bay of Bengal, 1,590 fathoms, and the Gulf of Manaar, 597 fathoms, and at various stations in the deep waters of the Atlantic. A single individual has been taken from the stomach of a cod caught on Georges Banks by Gloucester fishermen in 1874. This and one (No. 26165, U. S. N. M.) taken off the New England coast in 487 fathoms by the *Fish Hawk* were the first ever observed on the coast of North America. A specimen has been taken by the *Blake* at Station CXXXVIII, in the old Bahama channel, at a depth of 500 fathoms; and specimens have been obtained by the *Albatross* in the following localities: No. 35416, U. S. N. M., from station 2179, in 39° 30′ 10″ N. lat., 71° 50′ W. lon., at a depth of 510 fathoms; No. 35626, U. S. N. M., from station 2230, in 38° 27′ N. lat., 73° 02′ W. lon., at a depth of 1,168 fathoms; No. 35639, U. S. N. M., from station 2231, in 38° 29′ N. lat., 73° 09′ W. lon., at a depth of 965 fathoms; No. 35556, U. S. N. M., from station 2204, in 39° 30′ 30″ N. lat., 71° 44′ 30″ W. lon., at a depth of 728 fathoms; No. 35633, U. S. N. M., from station 2222, in 39° 03′ 15″ N. lat., 70° 50′ 45″ W. lon., at a depth of 1,537 fathoms; No. 35538, U. S. N. M., from station 2202, in 38° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; No. 33524, U. S. N. M., from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1,022 fathoms; No. 34908, U. S. N. M., from station 2118, in 13° 32′ 40″ N. lat., 62° 54′ W. lon., at a depth of 690 fathoms; No. 32660, U. S. N. M., from station 2001, in 37° 46′ 30″ N. lat., 74° W. lon., at a depth of 519 fathoms; a specimen from station 2392, in 28° 47′ 30″ N. lat., 87° 27′ W. lon., at a depth of 724 fathoms; one from station 2565, in 38° 19′ 20″ N. lat., 69° 02′ 30″ W. lon., at a depth of 2,069 fathoms; one from station 2393, in 28° 43′ N. lat., 87° 14′ 30″ W. lon., at a depth of 525 fathoms; one from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., at a depth of 571 fathoms. Two specimens were taken by the *Fish Hawk*, one (No. 16165, U. S. N. M.) from station 892, in 39° 46′ N. lat., 71° 05′ W. lon., at a depth of 487 fathoms; and another (No. 29068, U. S. N. M.) from station 1048, in 38° 29′ N. lat., 73° 21′ W. lon., at a depth of 435 fathoms.

It has also been obtained by the *Investigator* in the Bay of Bengal, 738, 922, 1,260, 1,590 fathoms, and in the Gulf of Manaar, 597 fathoms. (*Alcock.*) Also in the Laccadive Sea, the Andaman Sea, and the Bay of Bengal.

Family GONOSTOMIDÆ, Goode and Bean.

Dorsal behind ventrals. Anal long. Teeth in jaws small, interspersed more or less with longer ones. Gill rakers present. Pseudobranchiæ none. Adipose fin present or absent. Scales moderate, very caducous, and possibly in some instances absent from all or part of body.

KEY TO THE GENERA OF GONOSTOMIDÆ.

I. Dorsal on posterior half of body.
  A. Dorsal opposite anterior rays of anal. Intermaxillary short. Air bladder absent.
    1. Scales and adipose fin present. Luminous spots large and conspicuous. Vertical fins high and long.
      a. No vomerine teeth .... GONOSTOMA
    2. Scales and adipose fin absent.
      a. Photophores small. Vertical fins moderate in length .... CYCLOTHONE
      b. Photophores conspicuous. Anal long and high........................ BONAPARTIA

II. Dorsal nearly median.
  A. Dorsal slightly in advance of anal, its posterior rays overlapping anterior rays of same.
    A. Body rather elongate, its height about one-eighth of its length.
      1. Teeth in double rows in intermaxillary and mandible. Fangs on vomer. Air bladder absent. Scales present .... YARRELLA
    B. Body very elongate, its height one-twelfth to one-eighteenth of its length.
      1. Teeth small, unequal. Scales large, thin, deciduous .... DIPLOPHOS
III. Dorsal far in advance of anal, and but slightly behind ventrals.
  A. Vomerine fangs. Air bladder present. Scales present. Teeth in maxillary equal in size .... PHOTICHTHYS

GONOSTOMA, Rafinesque.

Gonostoma, RAFINESQUE, Ind. Ittiol. Sicil., genus XXVII, p. 64. BONAPARTE, Fauna Italica, Pesci, fasc. XXVII.

Body oblong, compressed, covered with large scales, subequal in size. Series of luminous (phosphorescent) spots run along the branchiostegous membrane, lower parts of the body, and tail. Head conical, much compressed, with the bones thin. Cleft of the mouth very wide; intermaxillary short, not extending far below the level of the eye; maxillary much longer, forming nearly the entire margin of the jaw; jaws armed with a single series of teeth, unequal in size, minute ones alternating with long, pointed teeth. A band of minute teeth on the palatine and pterygoid bones; palatine with a few conical teeth in front. Eye of moderate size. Pectoral and ventral fins well developed. Dorsal fin on the hinder half of the body opposite the anal; adipose fin small, sometimes fimbriated. Anal long. Caudal forked. Gill opening very wide, the outer branchial arch extending forward to behind the symphysis of the lower jaw, and beset with very long gill rakers. Branchiostegals, 13 or 14. Pseudobranchiæ none. Air bladder none.

GONOSTOMA DENUDATUM, RAFINESQUE. (Fig. 116.)

Gonostoma denudata, RAFINESQUE, Ind. Ittiol. Sicil., 65.—BONAPARTE, Fauna Italica, Pesci, fasc. XXVII, 1840, fig. 11. CUVIER & VALENCIENNES, Hist. Nat. Poiss., XXII, 376.—JOHNSON, Ann. and Mag. Nat. Hist., X, 1862, 279.—GÜNTHER, Cat. Fish. Brit. Mus., V, 391; Challenger Report, XXII, 172.—VAILLANT, Exp. Sci. Travailleur et Talisman, 102.

Gasteropelecus acanthurus, COCCO, Giorn. Sc. Lit., 1829, No. 77.

Gonostomus acanthurus, COCCO, Lett. su Salmoni; B. pl. 1, fig. 1; Nov. Ann. Sci. Nat., Bologna, fasc. 9, p. 3, pl. I, fig. 1.

The height of the body is contained 5½ times in the total length (without caudal); the length of the head 4 times. Jaws heterodont, the intermaxillary being armed with 2, the maxillary with about 12 large, distinct teeth, the spaces between them being filled with very small teeth; lower jaw similarly armed with 10 or 11 large teeth. The entire cheek is covered by the enormously enlarged infraorbital. (*Günther.*)

Radial formula: D. 14–15; A. 30–31; P. 11–12; V. 8; L. lat. 36.

This species is known to be common in the Mediterranean and the neighboring parts of the Atlantic, especially off Madeira.

Its first occurrence in the western Atlantic was in 1881, when it was trawled by the *Fish Hawk* off the New England coast. It was also obtained by the *Albatross*, at station 2665 in 263 fathoms, and by the French expedition, in 1,180 meters, off the coast of Morocco and off the Cape Verdes, in 460–580 meters.

GONOSTOMA BREVIDENS, KNER & STEINDACHNER. (Figure 117.)

Gonostoma brevidens, KNER & STEINDACHNER, Sitzb. Akad. Wissensch., Vienna, LXI, 1870, 443.

Body elongate, compressed, its height one-sixth of total (without caudal); length of head nearly one-fourth. Diameter of eye equal to length of snout, and about one-fifth length of head. Interorbital space about two-thirds diameter of eye. Mouth opening large, oblique, lower jaw projecting; upper jaw reaches back to the angle of the preoperculum, and is convex on its lower edge. Intermaxillary, maxillary, and mandible provided with a single row of sharp teeth, unequal in size. Tongue toothless. Two stronger teeth near the symphysis of the lower jaw. On the palatines and possibly upon the pterygoids a few small, sharp, pointed teeth. Gill opening very wide; the gill rakers long and thin. Preoperculum rounded. Twelve short branchiostegals; at the base of each of the 8 anterior ones a luminous dot. No pseudobranchiæ. Gill laminæ large. Probably the lower pharyngeal bones covered with teeth similar to those in the jaws, but in several rows. The dorsal has its origin nearly midway between the ventral and the anal, and is composed of 13 or 14 rays. Adipose fin thread-like. Ventral in front of the middle of the body (not behind, as stated by Kner) with 7 rays, reaching to the vent. Anal with from 17 to 19 rays, beginning under the last 3 or 4 rays of the dorsal, and the fin similar in height to the dorsal. The caudal is equal in length to that of the head from snout to preoperculum, and is strongly forked. Pectoral small, pointed, and nearly as long as the caudal. The thin, caducous scales with which the body is covered exhibit no radiating lines, simply delicate, concentric rings. On either side two longitudinal rows of inconspicuous phosphorescent spots, surrounded with black pigment; the lower row near the line of the belly begins near the throat and ends at the origin of the anal. In the space from the pectoral to the ventral are 16 spots; between the ventral and the anal 11; the upper row commences with 2 large spots upon the suboperculum, and continues back to the caudal. Color, dark gray; the back and belly silvery; all the fins whitish, uniform color.

Radial formula: D. 13–14; A. 17–19; V. 7.

This form, described in 1870 by Kner from a single badly damaged specimen taken in the Atlantic, is evidently a true *Gonostoma.* It closely resembles in many respects *Maurolicus Powerice* and *Maurolicus attenuatus* of authors, which seem to have little affinity with the typical species of *Maurolicus.*

We have before us a specimen taken by the *Blake* from Station CCXLV, off Havana, at a depth of 243 fathoms. Other specimens were taken by the *Blake* from Station XLIII, off Grenada, at a depth of 461 fathoms; from Station XLIV, off Grenada, at a depth of 101 fathoms; from Station XLV, in the old Bahama Channel, at a depth of 500 fathoms, and from Station XLVI, off Bequia, at a depth of 458 fathoms.

CYCLOTHONE, Goode and Bean.

Cyclothone, GOODE and BEAN, Bull. Mus. Comp. Zoöl., 1883, 221 (type, *Cyclothone lusca*=*Gonostoma microdon,* GÜNTHER).
Neostoma, VAILLANT, Exp. Scient. Travailleur et Talisman, 1888, 86 (type, *N. bathyphilum*).

Body elongate, somewhat compressed, apparently devoid of scales;* lower parts with inconspicuous series of luminous spots, with the latter arranged approximately as in *Gonostoma,* but usually much less conspicuous. Head conical, compressed; cleft of mouth very wide, oblique, extending behind the eye. The lower jaw strongly projecting. Maxillary long and slender, sickle-shaped; somewhat dilated posteriorly, but covering only an inconsiderable portion of the cheek. Upper jaw with a single series of needle-like teeth, some of which are enlarged; lower jaw with similar teeth, and in some species with a few canines in front. Teeth on vomer sometimes in patches, sometimes reduced to a single pair of fangs. Palatine and pterygoid teeth present or absent. Eye moderate, not conspicuous. Gill opening very wide, the membranes free from isthmus. Gill rakers numerous, long and slender. Pseudobranchiæ none. Branchiostegals. No air bladder. Dorsal and anal moderate, opposite, the latter much the longer. Adipose fin sometimes present.

CYCLOTHONE MICRODON, (GÜNTHER), GOODE AND BEAN. (Figure 114.)

Gonostoma microdon, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 188; Voy. Chall., XXII, 175.—ALCOCK, Bathybial Fishes of the Bay of Bengal, 1869, 25.
Cyclothone lusca, GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 1883, 221.—JORDAN, Cat. Fish. N. Am., 46.

Body elongate, its greatest height contained 7⅜ times in its length to base of middle caudal rays, its width being less than two-thirds of its height. Its height at the ventrals is contained $8\frac{1}{3}$ times in standard length; the least height of tail is half that of the body at the ventrals.

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* It is possible that very thin and exceedingly caducous scales may be present in life, but they are so exceedingly loosely attached that not a single one has been found upon hundreds of individuals examined by us, and at all events they are very different from the more persistent scales of *Gonostoma denudatum.*

Cheek naked. Head length contained $4\frac{2}{3}$ times in body length, its width about one-third of its length. The intermaxillary is very short, extending to vertical from posterior limb of anterior nostril. The maxillary is very strongly curved downward, and has a short knob at its anterior extremity, not visible without dissection. The maxillary extends backward to a distance from the tip of the snout equal to the length of the head without the snout. The peculiar arrangement of the teeth is described above in the generic diagnosis. Most of those in the maxillary are inclined strongly forward. Gill rakers, 9 above the angle and 13 or 14 below.

The long lower jaw, with the exception of the projecting tip, is included within the upper jaw; its length is equal to the distance from the anterior nostril to the end of the head.

Eye circular, close to the profile, the interorbital area being very narrow. Its length is equal to that of the snout, and contained 7 times in the length of the head.

Dorsal fin inserted at a distance from the tip of the snout equal to 3 times the length of the lower jaw, its base being as long as the head; the first ray is minute and about two-thirds as long as the eye; the second ray is about two-thirds the length of the base of the fin, and the subsequent rays rapidly and uniformly decrease in length to the last, which is about twice as long as the first. All the rays except the first are bifid.

The anal fin is inserted under the second ray of the dorsal; its base is half as long again as that of the dorsal, and nearly one-third as long as the body of the fish; its outline resembles that of the dorsal, though slightly emarginate, its longest ray a little longer than the longest of the dorsal, and half as long as the base of the fin. All the rays except the first are bifid.

Caudal forked, its middle rays less than half as long as the outer rays, equal in length to least height of caudal peduncle.

Pectoral inserted under the tip of the opercular flap, its length equal to the greatest height of the body.

Ventral inserted at a distance from the snout equal to twice the length of the head, its length slightly exceeding that of the pectoral, and contained 7 times in the standard body length.

Radial formula: B. VII-IX; D. 1+11—12; A. 1+16-20; C. 17; P. 9-10; V. 5.

Color blackish brown, the luminous pores inconspicuous, in a row in each side from the pectoral region to the tail, and another below it from the throat to the origin of the anal.

The *Challenger* obtained this form first from great depths near Bermuda, but subsequently at numerous localities in the Atlantic, Pacific, and Antarctic Oceans, at depths of from 500 to 2,900 fathoms; and it has since also been obtained from very numerous localities in the Atlantic by the *Albatross* and the *Blake*. Although many hundreds of specimens are in the National Museum, the species is so exceedingly delicate and hard to preserve that not one of them gives satisfactory opportunity for study.

Neostoma quadrioculatum, Vaillant, pl. VIII, fig. 2, must be very similar to this species (Exp. Sci. Trav. et Talisman, 99).

According to Alcock, *G. microdon* has been found by the *Investigator* in the Bay of Bengal, in 485 fathoms, and in the Andaman Sea, in 265 fathoms.

CYCLOTHONE BATHYPHILA (VAILLANT). (Figure 118.)

Neostoma bathyphilum, VAILLANT, La Nature, 1884, 184 (name and rough figure only); Exp. Sci. Travailleur et Talisman, 1888, 96, pl. VIII, fig. 1, 1a.

Body elongate, compressed; its greatest height about one-eleventh of its total length; the length of the head two-ninths. Vent midway between tip of snout and end of caudal rays. Eye moderate; its diameter equal to half the length of the snout, and also to the width of the interorbital space; it is placed far forward, so that the length of snout is greatly reduced and one-fourth length of head. Cleft of mouth exceedingly wide, oblique. Maxillary somewhat dilated, but not covering any considerable portion of the cheek, and its tip separated from the angle of the operculum by a distance greater than the diameter of the eye. The teeth upon the intermaxillaries are moderate in size; upon the maxillaries and the mandible larger, conical, separated by moderate intervals, which are filled with smaller teeth. Teeth also on palatines, pterygoids, and pharyngeals. Opercular bones very thin.

The origin of the dorsal and anal fins opposite, immediately behind the vent; the latter is more than twice as long as the former and reaches nearly to the tail, which is forked. A small adipose dorsal fin at a distance from the dorsal equal to the length of the base of the latter, and about the same distance from the anal. Pectoral and ventral composed of weak rays, the origin of the latter nearly midway from the base of the pectoral to the vent, and the tips of the longest rays reaching to the vent. Branchial arches 4, long and slender; very elongate gill rakers, 10 above and 15 below the angle of the first, the longest twice as long as the eye. Velvety black, with a number of luminous spots.

Radial formula: D. 12, 13: A. 21, 22; V. 7; P. 10. Branchiostegals, 13.

This species was obtained by the French explorers at depths of from 1,420 to 2,582 meters in the Gulf of Gascogne and off the Azores. It has since been found in considerable numbers in the western Atlantic by the *Albatross*, in the following localities: From station 2103, in 38° 47′ 20″ N. lat., 72° 37′ W. lon., at a depth of 1,091 fathoms; from station 2140, in 17° 36′ 10″ N. lat., 76° 46′ 05″ W. lon., at a depth of 966 fathoms; from station 2534, in 40° 01′ N. lat., 67° 29′ 15″ W. lon., at a depth of 1,234 fathoms, and No. 35514 U. S. N. M., from station 2196, in 39° 35′ N. lat., 69° 44′ W. lon., at a depth of 1,230 fathoms.

CYCLOTHONE ELONGATA, (GÜNTHER). (Figure 119.)

Gonostoma elongatum, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 187.—Challenger Report, XXII, 173, pl. XLV, fig. B.—ALCOCK, Ann. and Mag. Nat. Hist., 1891, II, 127; 1892, II, 354.

Sigmops stigmaticus, GILL, Proc. U. S. Nat. Mus., VI, 1883, 256.—JORDAN, Cat. Fish. N. Am., 46.

Height of body one-seventh of total length (without caudal); length of head two-ninths. Vent midway between root of caudal fin and eye. Eye moderate, two-thirds length of snout, about one-eighth length of head; its diameter less than width of interorbital space. Mouth exceedingly wide, maxillary extending to the posterior angle of the operculum, with a number of large teeth at considerable distances, with interspaces filled with smaller teeth; intermaxillary with 2 and mandible with about 10 large teeth. Infraorbital bone dilated, covering only about one-half of cheek. Opercular bones thin. Gill laminæ short. Gill rakers long. Branchiostegals 11, very short. Dorsal fin inserted a little behind the vertical from vent; greatest height exceeds that of the body at the point of its origin. Anal fin directly under the dorsal, much longer, extending nearly to root of caudal, highest in front. Pectoral narrow, slender, placed low; its length two-thirds that of the head. Distance of ventral from vent contained one-half in its distance from pectoral. Scales have apparently been present, on a part at least, of the body, namely, the tail and ventral line. Luminous organs very pink, with silvery margins, in two rows on either side of the abdomen.

Radial formula: D. 13; A. 27–30; P. 11; V. 7. Color black.

This species was obtained by the *Challenger* from two localities in the South Pacific, one, station 191, south of New Guinea, at a depth of 800 fathoms; one, station 194a, off Banda, at a depth of 360 fathoms, and has been found in considerable numbers in the deep waters off the American coast by both the *Blake* and *Challenger*,* and by the *Investigator* in the Indian Ocean, station 107, 738 fathoms, and station 107, 1,200 (?) fathoms.

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* *Cyclothone gracilis* (*Gonostoma gracile*, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 187; Challenger Report, XXII, 174, pl. XLV, fig. c.), found by the *Challenger* at depths from 245 to 2,425 fathoms, south of Japan, is elongate and apparently scaleless, as in the other species of the genus. The cheek is only partially covered by the interorbital; larger teeth in the upper jaw rather numerous. Height of body one-ninth of total length; length of head one-fifth. Adipose fin absent. D. 10; A. 26; P. 11; V. 6.

No. 33291, U. S. N. M., the type of Gill's genus *Sigmops* and species *Sigmops stigmaticus*, is an imperfect individual, from which the luminous spots had been rubbed off before it was examined by him; at the time when he studied the species this specimen was the only one which had been obtained, and the material was lacking for a complete comparison.

A single individual was taken by the *Blake* from Station XXXVIII; and specimens from the following localities have been obtained by the *Albatross*: No. 33368, U. S. N. M., from station 2077, in 41° 09′ 40″ N. lat., 66° 02′ 20″ W. lon., at a depth of 1,255 fathoms; No. 35446, U. S. N. M., from station 2193, in 39° 44′ 30″ N. lat., 70° 10′ 30″ W. lon., at a depth of 1,122 fathoms; No. 33291, U. S. N. M., from station 2039, in 38° 19′ 28″ N. lat., 68° 20′ 20″ W. lon., at a depth of 2,369 fathoms; No. 35465, U. S. N. M., from station 2196, in 39° 35′ N. lat., 69° 44′ W. lon., at a depth of 1,230 fathoms; No. 38174, U. S. N. M., from station 2725, in 36° 34′ N. lat., 73° 48′ W. lon., at a depth of 1,374 fathoms; No. 35606, from station 2219, in 39° 46′ 22″ N. lat., 69° 29′ W. lon., at a depth of 948 fathoms; and specimens from station 2718, in 38° 24′ N. lat., 71° 52′ W. lon., at a depth of 1,569 fathoms; from station 2535, in 40°, 03′ 30″ N. lat., 67° 27′ 15″ W. lon., at a depth of 1,149 fathoms; and from station 2149, in 13° 01′ 30″ N. lat., 81° 25′ W. lon., at a depth of 992 fathoms. No. 29069, U. S. N. M., was obtained by the *Fish Hawk* from station 1048, in 38° 29′ N. lat., 73° 21′ W. lon., at a depth of 435 fathoms.

BONAPARTIA, Goode and Bean, n. g.

Body oblong, compressed, slender behind, as in *Gonostoma;* covered with large cycloid scales, nearly equal in size. A continuous row of photophores on either side of the ventral line upon the lowest row of scales, extending from the anterior part of the lower jaw to the extremity of the base of the anal; others upon the caudal peduncle. Head much compressed, cleft of mouth very wide. Intermaxillary short; maxillary long, curved, forming the entire margin of the upper jaw, extending to the angle of the preoperculum. Jaws armed with a single series of not very numerous, acicular teeth, uniform in size; minute teeth on the palatines and pterygoids. Eye moderate. Pectoral and ventral fins small. Dorsal fin on the hinder half of the body, opposite the anterior portion of the anal. Adipose fin absent. Anal much longer and higher than dorsal. Caudal (probably) subtruncate. Gill-opening exceedingly wide, the branchial aperture extending nearly to the dorsal line on either side, and extending forward also to the symphysis of the lower jaw. Gill-rakers very long.

This species is named in honor of the Prince of Canino, whose admirable work upon the fishes of Italy, one of the most essential of the older works in the ichthyologist's library, is especially full in its discussion of the fishes allied to the one now under discussion.

BONAPARTIA PEDALIOTA, GOODE and BEAN, n. s. (Figure 120.)

Body elongate, compressed, its height contained 4½ times in its total length (without caudal); length of the head 3½ times. The diameter of the eye is about equal to the length of the snout, and about one-fifth of the length of the head; width of interorbital space less than diameter of the eye. Mouth large, oblique, the lower jaw slightly projecting; the upper jaw reaches back to the angle of the preoperculum, and is convex on its lower edge between the verticals from the anterior and posterior margins of the eye. The preoperculum extends backward in a sharp angle. The origin of the dorsal fin is equidistant from the root of the ventral and the axil of the posterior anal ray, and in the vertical from the base of the fourth or fifth anal ray; its length of base about two-fifths of that of the anal, and a little more than half the length of the head. Its greatest height, which is anteriorly, about equal to the length of its base. The space between this and the root of the caudal is equal to the length of the upper jaw. •The origin of the anal is equidistant from the posterior margin of the orbit and the base of the middle caudal rays. Its anterior third is greatly prolonged, falcate in form, giving to the lower outline of the fin a paraboloid curve. The length of the longest or third ray is about equal to the length of the base of the fin, and nearly four times the length of the twelfth ray. Posteriorly to the end of the dorsal the fin is low, decreasing from a length equal to the diameter of the orbit, to about half this dimension in the ultimate rays. The pectorals and ventrals are short and feeble, the ventral inserted about midway between the tip of the snout and the root of the caudal fin. Pectoral about midway from the tip of the snout to the origin of the anal. The caudal apparently about equal to the head in its length, but being mutilated, its form cannot be accurately determined. The scales resemble those of *Gonostoma*, without radiating lines. A single row of rather conspicuous phosphorescent spots extends from the lower jaw beneath the eye, to the end of the anal on either side, these dots being heavily margined and with black above. There are twelve of these between the branchial opening and the origin of the ventral, five between the ventral and the anal, sixteen in the anal series, and two upon the caudal peduncle, one at the origin of the lower caudal rays, the other in the vertical above it and about one-fifth of the distance from the dorsal outline. A series of vertical, elongated spots, apparently phosphorescent, upon either side of the lower jaw, giving it a pectinate appearance.

Color (in alcohol) brownish gray; the head with silvery reflections.

Radial formula: D. 20; A. 30; L. lat. 46.

The types of this species are two specimens, about one and two inches long respectively, obtained by the steamer Albatross from station 2642 in 25° 20′ 30″ N. Lat., 79° 58′ W. Long., at a depth of of 217 fathoms.

YARRELLA, Goode and Bean, n. g.

Body elongate, compressed, covered with rather large, thin, deciduous scales; the lower parts with luminous spots. Head conical, compressed; cleft of mouth very wide, oblique, extending behind the eye. Lower jaw strongly projecting. Intermaxillary comparatively long, forming about half of margin of upper jaw. Upper jaw with a single row of teeth in the maxillary, and a double row in the intermaxillary, interspersed with occasional stronger teeth; those in the intermaxillary directed downward or backward, those in the maxillary somewhat forward. Mandible with double row of small teeth, outer row with some larger ones. A row of short, weak teeth on the palatines; head of vomer with a short fang on either side. Eye moderate; gill openings very wide, the membranes free from the isthmus. Gill rakers not very numerous, rather short and stout. Pseudobranchiæ none. Branchiostegals numerous, 14. No air bladder. Dorsal and anal well developed, the former far in advance, its posterior rays over the origin of anal. No adipose fin. Caudal moderately forked.

This genus is in several respects intermediate between *Gonostoma* and *Photichthys*. It is named in honor of William Yarrell, F. L. S., (1789–1856), the English ichthyologist.

YARRELLA BLACKFORDI, GOODE and BEAN, n. s. (Figure 121.)

Body elongate, its greatest depth equal to length of head without snout, and contained 7½ times in the total (without caudal). Length of head 4½ times in total (without caudal). Eye moderate, its diameter two-thirds length of snout, and contained 7 times in length of head. The maxillary extends far behind the eye, its length equal to that of the postorbital part of the head. Length of intermaxillary nearly two fifths length of head. Teeth as described under genus. Gill rakers 6 above and 13 below the angle of the first arch, the longest about as long as the eye. Branchiostegals, 14. Dorsal origin a little nearer root of caudal than tip of snout, its origin nearly over the middle of the space between the ventral and the anal origin, and its posterior ray over the seventh ray of the anal; the length of its base equals that of postorbital part of head; rays imperfect, the longest fragment remaining equal to longest of anal, and not much more than one-third length of head. Distance of ventral origin from tip of snout contained 2½ times in total (without caudal); rays imperfect, the longest only about one-fourth of length of head. Pectoral placed low, on a narrow base. Scales have evidently been present, and of considerable size, but their character and number can not be ascertained.

Radial formula: D. 15; A. ii, 27; V. 6; P. 8.

Color, purplish brown; 9 phosphorescent spots on the isthmus, 25 between the symphysis of the mandible and the root of ventral, 12 between the origin of ventral and vent, and 26 from vent to tail. A second row of pearly spots extends from above root of pectoral to origin of anal.

This species is dedicated to E. G. Blackford, president of the board of fish commissioners of the State of New York, in recognition of his services in the promotion of ichthyological studies.

The type of this species was obtained by the *Albatross* from station 2376, in 29° 03′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms. Two other specimens, the larger one 9¼ inches in length, were taken by the *Albatross* at the same station.

DIPLOPHOS, Günther.

Diplophos, GÜNTHER, Journ. Mus. Godeffroy, II, 1873, p. 101; Challenger, Report XXXI, 1889, p. 32.

Body much elongated, band-shaped (covered with large thin deciduous scales?). A double series of phosphorescent organs runs along the lower side of the body and tail. Head compressed, with pointed snout and projecting lower jaw. Mouth very wide but slightly oblique; jaws armed with small pointed teeth rather unequal in size; eye of moderate size; paired fins well developed; dorsal fin in advance of the anal, behind the ventral; adipose fin none; anal very long. (*Günther.*)

This genus is represented by two species—the type, *Diplophos tænia*, and another from the Pacific, *Diplophos pacificus* (Challenger Report), l. c. 33. Both species were obtained near the surface, but their relations with deep-sea forms are very intimate.

DIPLOPHOS TÆNIA, GÜNTHER. (Figure 126.)

Diplophos tænia, GÜNTHER, Journ. Mus. Godeffroy, II, 1873, p. 104; Chal. Report, XXXI, 1889, p. 32, pl. IV, fig. c.

The length of the head is one-sixth of the total length, the greatest depth of the body only one-sixteenth. Snout more than twice as long as the eye, pointed, with the lower jaw longest. The maxillary reaches backwards far behind the eye. Dorsal fin short, its first ray somewhat nearer to the end of the snout than to the root of the caudal; anal fin commencing below the last dorsal ray, and ending at a short distance from the caudal. Paired fins short; pectoral inserted near to the lower profile; ventrals reaching nearly to the origin of the dorsal. The phosphorescent organs are rounded black bodies, without silvery centre; they are very numerous and arranged in two parallel series along each side of the lower profiles. Those of the upper series are smaller than those of the lower, are quite round and do not extend so far towards the head and the caudal, as the lower. The lower are larger and transversely oblong. A pair of still larger luminous organs occupies a position in front of the base of the lower caudal rays. Brownish. (*Günther.*)

Radial formula: D. 8; A. ca. 43; V. 8.

Taken in tow-net at night, lat. 30° S., lon. 24° W., and lat. 22° N., lon. 30° W.

PHOTICHTHYS, Hutton.

Phosichthys, HUTTON, Cat. New Zealand Fish., 55.
Photichthys, HUTTON, Trans. N. Z. Inst., V, pl. XV, fig. 90.—GÜNTHER, Chall. Rep., XXII, 177.

This genus is closely allied to *Gonostoma*, from which it differs in the following points:

Both jaws are armed with a single series of teeth, those of the maxillary being small and equal in size. The intermaxillary is armed with 2 large fangs besides the small teeth; mandible with 7 large equidistant teeth, the spaces between them being filled up with very small denticles. Vomer with a fang on each side of its head; palatine with strong, curved teeth, which gradually decrease in size backwards. The dorsal fin corresponds in position to the space between ventral and anal; adipose fin small. Air bladder present as a long, simple sac with thick walls. (*Hutton*, *Günther.*)

This genus is represented by a single species, *P. argenteus*, fig. 122 (A), described from specimens thrown ashore at Cook Straits after severe gales. There are specimens in the British Museum and the Wellington Museum.

Family ASTRONESTHIDÆ.

Astronesthidæ, GILL, MS.

Stomatoid fishes, with adipose dorsal present, and scaleless body. Dorsal fin inserted behind vent, but in front of anal. (*Gill, MS.*)

ASTRONESTHES, Richardson.

Astronesthes, RICHARDSON Voy. Sulph., Ichth., 1845, 97.—GÜNTHER, Cat. Fish. Brit. Mus., v, 424.
Phænodus, LOWE, Proc. Zoöl. Soc. London, 1850, 250.

Body rather elongate, compressed, scaleless. Head compressed, the snout short, the mouth wide. Teeth pointed, unequal. Upper jaw with 4 long, curved canines; lower with 2; maxillary teeth fine, subequal; palatines with a single series of small, pointed teeth, similar to those on tongue. Eye moderate. Throat with a barbel. Dorsal fin long, inserted in front of anal, behind ventrals; adipose fin present; caudal forked; paired fins well developed. Gill rakers minute. No pseudobranchiæ. No air bladder. Lower parts with phosphorescent spots. (*Jordan and Gilbert.*)

ASTRONESTHES NIGER, RICHARDSON. (Figure 123.)

Astronesthes nigra, RICHARDSON, Voy. Sulph., Ichth. 97, pl. 50, figs. 1-3.
Astronesthes niger, GÜNTHER, Cat. Fish. Brit. Mus., v, 425.
Stomias Fieldii, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 378.
Chauliodus Fieldii, CUVIER and VALENCIENNES, *l. c.*, XXII, 389.
Phænodon ringens, LOWE, Proc. Zoöl. Soc., 1850, 251.

Black, with about 22 luminous spots between chin and ventrals. Barbel a little longer than head. Dorsal beginning just behind base of ventrals; pectoral not reaching nearly to ventrals. Jaws equal. Eye large, well forward.

Radial formula: Head 4; depth 5½. D. 17; A. 14.

This species is represented in the national collection by only a single specimen (No. 34538, U. S. N. M.), the tye of *Chauliodus Fieldii*, C. and V., obtained by Capt. Field, in May, 1819, on a voyage from Mogador to New York, probably at the surface. This specimen passed from the hands of Dr. Mitchill to those of Mr. J. Carson Brevoort, then to Mr. E. G. Blackford, by whom it was presented to the National Museum.

ASTRONESTHES GEMMIFER, GOODE and BEAN, n. s. (Figure 124.)

Length of head contained 4½ times in the total (without caudal); its depth 8 times, and the depth of the body 5½ times. Barbel about equal in length to the head. Origin of the dorsal fin a little nearer tip of snout than root of caudal; length of its base contained nearly 4 times in the total (without caudal); its longest ray two-thirds the length of the head. Ventral origin directly under the dorsal origin; length of the ventral contained 5½ times in the total (without caudal); it does not nearly reach to the vent. The distance of the anal origin from the root of the caudal is a little more than one-fourth of total length (without caudal). Eye longer than snout; one-fourth as long as the head. Pectoral is nearly one-seventh as long as body (without caudal).

Radial formula: D. 17; A. 17; V. 7; P. 9.

The type of this species (No. 24645, U. S. N. M.), about 7½ inches in length, was taken from a halibut's stomach, January 26, 1890, by the schooner *Polar Wave*, in 44° 25′ N. lat., 53° 12′ W. lon. The halibut was taken in about 300 fathoms.

This species may possibly prove identical with *A. niger*. The limits of variation of the fin rays in this genus has not been determined for lack of sufficient material. The species has 17 anal rays and numerous gem-like dots on the lower part of the body, there being about 30 in the series from the symphysis of the mandible to the ventral.

ASTRONESTHES RICHARDSONII, POEY. (Figure 125.)

Astronesthes Richardsonii, POEY, Mem. Hist. Nat. Cuba, I, 1858, 176.
Chauliodus Richardsonii, POEY, *loc. cit.*, 1, pl. x, fig. 2.

Length of head contained 4⅔ times in total (without caudal); its greatest depth nearly two-thirds of its length. Body slender, its height at the dorsal origin equal to length of postorbital part of head, and one-eighth of total length (without caudal). Snout very short, two-thirds diameter of the eye, which is contained nearly 4 times in length of head. No teeth on the vomer, and a few scattered small teeth on the palatine bones. The origin of dorsal is nearer to root of caudal than tip of snout. Length of dorsal base half that of the head; rays all imperfect. Ventral origin immediately under the dorsal origin; it does not nearly reach to the vent, and its length equals that of the postorbital part of the head. Distance of anal origin from root of caudal equals length of head. Length of anal base equals postorbital part of head. Adipose fin directly over the tenth ray of the anal. Pectoral narrow and slender, length of the longest ray now remaining being two-fifths that of the head. Color, black; about 35 luminous dots between the symphysis of the mandible and the origin of the ventrals.

Radial formula: D. 11; A. 14 or 15; V. 7; P. 9.

A single specimen (No. 35540, U. S. N. M.), 7½ inches in length, from Cuban waters.

Family STOMIATIDÆ.

Stomiatidæ, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 424.—GILL, Johnson's Cyclopædia, IV, 1677.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 285.

Isospondylous fishes with elongate, tapering body naked or covered with very thin and deciduous scales. Head oblong. Snout short and rounded. Eyes large and far forward. Opercular apparatus imperfectly developed. Mouth enormous with deep lateral cleft. Lateral margin of upper jaw formed by the supramaxillary and provided with teeth along the edges. Teeth usually strong, unequal, some of them often fank-like or barbed. Gill membranes not joined, free from the isthmus. Branchiostegals numerous (12-17). A long barbel at throat. No pseudobranchiæ. Dorsal fin short, median or posterior, without spines. Anal free, far behind and small. Caudal distinct. Pectorals low down on the scapular arch and narrow. Ventrals inserted far backward. Stomach cæcal, and pyloric appendages absent. Sides with phosphorescent spots. Skeleton feebly ossified. Eggs excluded through oviducts.

KEY TO THE SUBFAMILIES AND GENERA.

- A. Pectorals present.
  - I. Body covered with fine scales. Ventrals very far back .... STOMIAS
  - II. Body naked.
    - a. Pectorals with separate ray. Vomer with teeth. Teeth in jaws long.
      - 1. Teeth, depressible. Palatines with teeth .... ECHIOSTOMA
      - 2. Teeth, not depressible. Palatines toothless. Luminous organs very numerous.. OPOSTOMIAS
    - b. Pectorals normal. Vomer toothless.
      - 1. Dorsal and anal similar in size and opposite.
        - a. Teeth fang-like. Pigment spots in place of lateral line. Eye small.. GRAMMATOSTOMIAS
        - b. Teeth small, subequal. Eye large.. PACHYSTOMIAS
        - c. Teeth stout. Eye small. Ventrals high on side of trunk .... BATHOPHILUS
      - 2. Anal much longer than dorsal. Palatine teeth absent .... EUSTOMIAS
- B. Pectorals absent.
  - 1. Body naked.
    - a. Dorsal behind vent.. PHOTONECTES

STOMIAS, Cuvier.

Stomias, CUVIER, Règne Anim., II, 1817 (type, *Esox boa*, Risso, from the Mediterranean).—GÜNTHER, Cat. Fish. Brit. Mus., V, 426.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 286.

Stomiatids with body elongate, compressed, covered with exceedingly fine and deciduous scales, which are scarcely imbricated, lying in subhexagonal depressions in the skin. Head compressed, snout very short, and mouth cleft enormous. Mouth oblique, with lower jaw projecting. Teeth pointed, unequal, those of premaxillaries and mandible very large; maxillary with fine teeth; vomer with a pair of fangs; palatines and tongue with smaller pointed teeth. Eye moderate. Opercular portion of the head short; a large fleshy barbel suspended from the hyoid region. Vent far back. Dorsal comparatively long, far back, opposite anal. Pectorals and ventrals small, the latter far back. Caudal fin moderate. Lower side of head, body, and tail with series of phosphorescent dots. Gill openings very wide. No pyloric cæca. (*Günther.*)

STOMIAS FEROX, REINHARDT. (Figure 127.)

Stomias ferox, REINHARDT, Vidensk. Selsk. Naturv. og Mathematik, Afhandl., X, pl. XXVII.—KRÖYER, Naturh. Tidssk., II, 1846, 263.—GAIMARD, Voy. Skand., Atlas, Poiss., pl. XXIV, fig. 1.—GÜNTHER, Cat. Fish. Brit. Mus., V, 426; Challenger Report, XXII, 205.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 220.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 286.

Height of body about one-twelfth of total length; length of head about one tenth. Barbel longer than head, tapering, not fringed. Pectorals and ventrals not produced. Color, black.

Radial formula: D. 17; A. 21; P. 6; V. 6.

This remarkable form was first found off the coast of Greenland by the Scandinavian naturalist, and subsequently in the North Atlantic in 40° 41′ 30″ N. lat., 65° 68′ W. lon., at a depth of 304 and 524 fathoms. Subsequently by the *Blake* at Station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms, and at Station CCCVI, in 41° 32′ 50″ N. lat., 65° 55′ W. lon., at a depth of 524 fathoms, and at Station CXXXVII, off Bahama Channel. Also by the *Albatross* in the following localities: No. 29067, U. S. N. M., from station 1048, in 38° 29′ N. lat., 73° 21′ W. lon., at a depth of 435 fathoms; from station 2570, in 39° 54′ N. lat., 67° 05′ 36″ W. lon., at a depth of 1,813 fathoms; No. 35417, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; No. 33556, from station 2095, in 39° 29′ N. lat., 70° 58′ 40″ W. lon., at a depth of 1,342 fathoms; from station 2427, in 42° 46′ N. lat., 51° W. lon., at a depth of 523 fathoms; from station 2571, in 40° 09′ 30″ N. lat., 67° 09′ W. lon., at a depth of 1,356 fathoms; No. 35623, U. S. N. M., from station 2236, in 39° 11′ N. lat., 72° 08′ 30″ W. lon., at a depth of 636 fathoms; No. 35453, U. S. N. M., from station 2188, in 39° 54′ 30″ N. lat., 71° 08′ W. lon., at a depth of 235 fathoms; No. 35614, U. S. N. M., from station 2201, in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms; No. 28876, U. S. N. M., from station 995, in 39° 40′ 30″ N. lat., 71° 31′ W. lon., at a depth of 358 fathoms; from station 2428, in 42° 48′ N. lat., 50° 55′ 30″ W. lon., at a depth of 826 fathoms; from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; No. 35408, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; No. 35409, U. S. N. M., from station 2181, in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms; No. 35456, U. S. N. M., from station 2191, in 39° 45′ 30″ N. lat., 70° 17′ W. lon., at a depth of 961 fathoms; No. 33561, U. S. N. M., from station 2101, in 39° 18′ 30″ N. lat., 68° 24′ W. lon., at a depth of 1,686 fathoms; from station 2429, in 42° 55′ 30″ N. lat., 50° 51′ W. lon., at a depth of 471 fathoms; from station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; from station 2572, in 40° 29′ N. lat., 66° 04′ W. lon., at a depth of 1,769 fathoms; from station 2554, in 39° 48′ 30″ N. lat., 70° 40′ 30″ W. lon., at a depth of 445 fathoms; No. 28780, U. S. N. M., from station 936, in 39° 46′ 30″ N. lat., 69° 47′ W. lon., at a depth of 716 fathoms; No. 28838, U. S. N. M., from station 953, in 39° 52′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 724 fathoms; and a specimen from the stomach of a fish obtained on the western part of the Grand Bank, at a depth of 120 fathoms.

STOMIAS BOA (RISSO), CUVIER. (Figure 128.)

Esox boa, RISSO, Ichth. Nice, 1810, 330, pl. x, fig. 34.—RISSO, Hist. Nat. Eur. Mérid., III, 1, 440, fig. 40.
Stomias boa, CUVIER, Règne Animal, 1st ed., II. 1817, 184, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XVII, 368, fig. 545.—VAILLANT, Exp. Sci. Travailleur et Talisman, 115.
Stomias barbatus, CUVIER, l. c.—BONAPARTE, Fauna Italica, Pesc. Fasc. XXVII (bad fig.).

The height of the body is contained 12½ times in the total length, without caudal; the length of the head 9½ times. Barbel as long as the head, terminating in 3 filaments. Pectoral and ventral fins very narrow and elongate. Each of the median abdominal series of luminous spots contains 54 between pectoral and ventral fins, 14 between ventral and anal, and 15 between the origin of the anal and caudal. (*Günther.*)

Radial formula: D. 18; A. 18; P. 6; V. 5; L. lat. 88.

Stomias boa was obtained by the French expedition in eleven different localities, one individual from each, at various depths in the Gulf of Gascogne, on the coasts of Portugal and Morocco, on the Banc d'Arguin, and about the Cape Verde Islands, at depths from about 405 to 1,800 meters, the greatest depth being in the Gulf of Gascogne.

Dr. Peters also identified this form from the Pacific. [Monatsbericht, Ak. Wiss., Berlin, 1876, 1846.

Vaillant having examined a considerable amount of material, coincides with the opinion of Günther that *Stomias boa* and *Stomias barbatus* are identical, but reinforces recent opinions as to the distinctness of *Stomias ferox*, which is well characterized by its coloration and its slender body, as well as by the form of the mandibular barbel, which, although it is soft and extensible, so that the characters derived from its relative dimensions are not of special value, has an unfringed tip which may be regarded as a satisfactory character, although even upon this question there is some doubt.

STOMIAS AFFINIS, GÜNTHER. (Figure 129.)

Stomias affinis, GÜNTHER, Challenger Report, XXII, 1885, 205, pl. LIV, fig. A.

Scaleless, but with the hexagonal divisions of the skin distinct. The height of the body is one-twelfth of the total length, without caudal, the length of the head one-eighth. Teeth fixed. The barbel is about as long as the head, and terminates in 3 filaments (fig. a); the end of the stem of the barbel white, with a black pigment spot, and probably luminous. Pectoral and ventral fins narrow and elongate, especially the latter, which taper into a filament and extend beyond the anterior anal rays. Anal fin higher than dorsal. Each of the abdominal series of luminous spots contains 43 between the pectoral and ventral fins, 6 between ventrals and anal, and 15 (16) between the origin of the anal and caudal; another parallel series runs below, and a third above the middle of the side of the body. Fins white, dorsal, anal, and ventrals with black margins. (*Günther.*)

Radial formula: D. 17; A. 20; P. 6; V. 5.

Known from one specimen, 5 inches long, taken south of Sombrero Islands, Challenger station 23, at a depth of 450 fathoms.

Stomias nebulosus, ALCOCK, a related form (Ann. and Mag. Nat. Hist., 1889, II, 451), is from the Gulf of Manaar, 597 fathoms. *S. elongatus*, ALCOCK (l. c., 1891, II, 129), is from the Indian Ocean, 738 fathoms.

ECHIOSTOMA, Lowe.

Echiostoma, LOWE, Proc. Zoöl. Soc. Lond., 1843, 87 (type, *Echiostoma barbatum*, Lowe).—GÜNTHER, Cat. Fish. Brit. Mus., V, 427.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 286.

Body elongate, compressed, naked. Head compressed, with short snout and wide; mouth cleft. Teeth pointed, unequal, those on premaxillary and front of lower jaw being longest; maxillary teeth in single series, those of its lower two-thirds being small; teeth of hinder part of the mandible in double or triple series; vomer with a pair of fangs; palatines with a single series of small pointed teeth; two groups of similar teeth on tongue. Eye moderate. Opercular portion of head very narrow and flexible; a fleshy barbel on the center of the hyoid region. Dorsal fin far back, opposite anal. Caudal forked. Vent not far in advance of caudal fin. Pectorals and ventrals feeble, the latter behind the middle of the body. Series of phosphorescent dots along the lower side of the head, body, and tail. Gill openings very wide. Gill rakers minute. No pseudobranchiæ. No air bladder.

ECHIOSTOMA BARBATUM, LOWE. (Figure 130.)

Echiostoma barbatum, LOWE, Proc. Zoöl. Soc. London, 1843, 87.—GÜNTHER, Cat. Fish. Brit. Mus., v, 427; Voyage Challenger, XXII, 206, pl. LIII, fig. b.—GOODE and BEAN, Bull. Essex. Inst., 1879, 23.—JORDAN and GILBERT, Bull. 16, U. S. N. M., 287.

Hyperchoristus Tanneri, GILL, Proc. U. S. N. M., VI, 1883, 256.—JORDAN, Cat. Fish. N. Am., 1885, 41.

Black, with an elongate, club-shaped (phosphorescent) rose-colored spot between the maxillary and the eye. Barbel as long as head (in specimen seen), fringed at its tip. "Upper ray of pectoral produced in a long and slender filament, reaching nearly to the root of the ventrals" (wanting in specimens examined). Ventrals narrow, elongate. Head 6 in length; depth 9.

Radial formula: B. 12; D. 12–15; A. 17; P. 1+3; V. 8.

Until in 1879 a specimen of this species (No. 22364, U. S. N. M.), was brought in by one of the Gloucester fishing vessels, this form was known only from Madeira, where a specimen 13½ inches long was taken in a net close to the shore, prior to 1843, when it was described by Lowe. Since 1879 numerous specimens have been obtained: two by the *Blake*, from Stations CXXXVI and CXXXVII, in the old Bahama Channel, at a depth of 500 fathoms; and others by the *Albatross*, No. 35624, U. S. N. M., from station 2236, in 39° 11′ N. lat., 72° 08′ 30″ W. lon., at a depth of 636 fathoms; No. 33444, U. S. N. M. (type of *Hyperchoristus Tanneri*, Gill), from station 2083, in 40° 26′ 40″ N. lat., 67° 05′ 15″ W. lon., at a depth of 959 fathoms.

ECHIOSTOMA MARGARITA, GOODE and BEAN, n. s. (Figure 131.)

The length of the individual to base of the caudal is 393 millimeters (13¾ inches). The greatest depth of the body, 51 millimeters, equals the length of the head and is contained nearly 8 times in the total length. A stout barbel is situated at a distance of 23 millimeters from the tip of the lower jaw; its length, 28 millimeters, is somewhat more than one-half the length of the head; at the extremity this barbel is divided into six fringes, one of which is whitish; a whitish band on the barbel near the root of the fringes. There are about 31 teeth on each side of the maxilla, and 36 on each side of the mandible; none of the teeth in the jaws being enlarged. The vomer has a pair of depressible fangs on the right side and a single one on the left. There are 5 depressible teeth on each palatine. Lingual teeth in about four rows. The largest teeth in the jaws are scarcely more than 2 millimeters long.

The length of the upper jaw, 40 millimeters, is four-fifths the length of the head. The mandible, 48 millimeters, is nearly as long as the head. The diameter of the eye, 8 millimeters, equals the length of the snout and is one-fifth as long as the upper jaw. The mandible projects beyond the upper jaw when the mouth is closed a distance equal to one-half the length of the eye. Nostrils about midway between the eye and the tip of the snout. The gill laminæ are all well developed and increase in size backwards, not entirely concealed by the opercular bones. The gill rakers consist of minute scattered spines.

The distance of the vent from the base of the caudal, 64 millimeters, is contained 6¼ times in the total length. The anal begins immediately behind the vent and extends nearly to the base of the tail. The dorsal is immediately over the anal. The origin of the ventral is 211 millimeters from the tip of the snout and 109 millimeters from the base of the caudal. The sixth and longest ray of the ventral, 43 millimeters, is five-sixths the length of the head. The pectorals of both sides have been torn off. Two rows of minute phosphorescent dots similar to those in *E. barbatum* and similarly situated. A pearl-colored spot above the maxilla, beginning at the hind margin of the eye; its length about two-thirds that of the eye;

Radial formula: D. 18; A. 24; V. 7; P. O.

Color very dark, extending even inside of the mouth.

On the 13th of March, 1885, the steamer *Albatross* trawled a large specimen of *Echiostoma* at station 2394, N. lat. 28° 38′ 30″, W. lon. 87° 02′, in 420 fathoms (U. S. Nat. Mus., No. 39282); this locality is about in the middle of the Gulf of Mexico. The single example taken is in bad condition, but it is named and described here simply to call attention to its existence in the region. There is no doubt that the species is distinct from *Echiostoma barbatum*, as it has very small subequal teeth:

OPOSTOMIAS, Günther.

Echiostoma, sp., GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 180; Narrative of Challenger Expedition, I, 412.
Opostomias, GÜNTHER, Challenger Report, XXII, 288 (type, *O. micripnus*, GÜNTHER, *loc. cit.*, 208, pl. LIII. fig. A).

A genus of stomiatoid fishes, closely allied to *Echiostoma*, but differing in dentition, the jaws armed with few strong, *nondepressible* teeth, received in deep hollows in the opposite jaws. Maxillaries and palatines toothless. Pectoral with separate ray. Body naked. An immense number of luminous organs.

This genus is known from a single specimen, 15½ inches long, captured by the *Challenger* south of Australia, at a depth of 2,150 fathoms, described by Günther as *Echiostoma micripnus*. (Fig. 132.)

GRAMMATOSTOMIAS, Goode and Bean, n. g.

Similar in general appearance to *Echiostoma*. Head short, compressed. Body compressed, moderately elongate. Dorsal and anal with numerous rays, placed opposite each other and close to the root of the caudal. Ventrals in advance of the middle of the body, at a great distance from the vent. Pectorals placed near the abdominal outline, consisting of a short filament very slightly separated from the rest of the fin, and several rays connected by a membrane. Two rows of minute phosphorescent spots on the body similar to those in *Echiostoma*. A very long and slender hyoid barbel. Mandibular teeth very unequal in size, comparatively few in number, arranged in two rows, an outer row of fixed teeth and an inner row of depressible ones. The first pair, near the tip of the mandible, is very greatly enlarged and passes outside of the upper jaw when the mouth is closed. Intermaxillary teeth uniserial or nearly so, the edge of the bone posteriorly with minute cirri. A pair of small, fixed, curved fangs in front, followed by a pair of larger movable ones. Vomer toothless. Palatines with several weak teeth. No lingual teeth. Upper pharyngeals present. A pearl-colored spot on the cheek, similar to that in *Echiostoma*. Four gills; a short, narrow slit behind the fourth. Gill rakers not numerous, short, spine-like. Gill laminæ increase in size backwards. A series of pigment cells along the median line of the body, so arranged as to simulate a lateral line. Eye small, Caudal lobes apparently unequal. Skin naked, its whole surface sprinkled with minute raised pigment spots, each with a light center.

GRAMMATOSTOMIAS DENTATUS, GOODE and BEAN, n. s. (Figure 133.)

The greatest height of the body equals the length of the head without the snout and is one-seventh of the total length without caudal. The maxilla is long and slender; its length is contained 6½ times in the total. The length of the mandible is contained 5⅜ times in the total. The eye is as long as the snout, about one-fifth as long as the head. The nostrils are a little nearer to the eye than to the tip of the snout. The anterior nostril is placed nearly in front of the middle of the eye in a very short tube; the posterior is on a level with the top of the eye and is merely a small slit. The supramaxillary and intermaxillary are closely welded, but their separation is marked by a changing in the character of the teeth; those on the supramaxillary being minute cirri. The large fangs in the tip of the mandible are two-sevenths of the length of the upper jaw.

The hyoid barbel is placed at a distance from the symphysis of the mandible, which is about equal to the enlarged fangs of the mandible, or one-fifth of the length of the mandible. The length of the barbel is nearly one-third of the total. The pectoral is situated close behind the head and near the ventral outline; its first ray is distinct from the other three, although placed close to them, and is not produced. The greatest length of the pectoral is about one-fourth that of the head. The ventrals are placed in advance of the middle of the total length, their distance from the origin of the pectorals being one-half as great as from the caudal base. The fourth and longest ray nearly equals the greatest height of the body. The distance of the dorsal origin from the caudal base is contained 5¼ times in the total length. The longest dorsal ray, which is in the middle of the fin, is one-half as long as the longest of the ventral rays. The length of the dorsal base is contained 6½ times in the total length. The base of the anal is slightly longer than that of the dorsal, and its longest ray is about three-fourths as long as the longest dorsal ray. The caudal lobes in the only specimen available for study are unequal, the lower one being much longer than the upper, but this may be the result of accident. There are two rows of luminous spots, one close to the ventral outline, which becomes obsolete before it reaches the origin of the anal, and another in the lower third of the height of the body, which becomes indistinct about the middle of the total length; 14 of these spots between the pectoral and the ventral in the lower series and 11 in the upper series.

Radial formula: D. 20; A. 24; V. 7; P. 1+3; C. 17.

The type of the species is a specimen 160 millimeters long (Catalogue, No. 37370), taken by the *Albatross* at station 2565, N. lat. 38° 19′ 20″, W. lon. 69° 02′ 30″, from 2,069 fathoms.

PACHYSTOMIAS, Günther.

Echiostoma, sp., GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 180.
Pachystomias, GÜNTHER, Challenger Report, XXII, 210 (type, *P. microdon*, GÜNTHER, *l. c.*, 210, pl. LIII, fig. c).

A genus of Stomiatoid fishes, with naked body, normal pectorals, toothless vomer and maxillaries, and comparatively feeble dentition. Luminous organs large and numerous.

This genus is known by a single species, *Pachystomias microdon* (fig. 134), captured by the *Challenger* at the depth of 2,440 fathoms, to the northeast of Australia.

BATHOPHILUS, Giglioli.

Bathophilus, GIGLIOLI, Pelagos, p. 261, figure, GÜNTHER, Challenger Report, XXII, 215.

Body compressed, rather short, scaleless, minutely granulated; vent far behind the middle of the length. Head compressed; cleft of the mouth very wide; teeth stout. Eye small. Barbel none. Dorsal fin opposite to the anal, which commences behind the vent. Pectoral fins long, ventrals narrow, *inserted high upon the side of the trunk.* No luminous organs (?). A single species, *B. nigerrimus* (fig. 136), taken at Messina by Giglioli, and now in the Florence museum.

EUSTOMIAS, Vaillant.

Eustomias, VAILLANT, La Nature, 1884, 85 (name only mentioned); Exp. Sci. Travailleur et Talisman, 1888, 112 (type, *E. obscurus*, Vaill.).—GÜNTHER, Voy. Chall., XXII, 204.

Stomiatids, with anal fin much longer than dorsal and beginning farther forward. "Barbel very elongate. Ventrals composed of two groups of rays. Jaws strongly armed with teeth in single rows; teeth absent from palatines, but present on the tongue. Body entirely naked, but with numerous longitudinal luminous dots, and a large luminous body directly behind the eye." (*Vaillant.*)

A single species, *E. obscurus*, from off the Azores, at a depth of 2,792 meters.

EUSTOMIAS OBSCURUS, VAILLANT. (Figure 135.)

Eustomias obscurus, VAILLANT, Exp. Sci. Travailleur et Talisman, 113, pl. III, figs. 3, 3a.

Body elongate; height scarcely one-twentieth of length, and thickness one-thirtieth.

The head, whose length is one-seventh of the length of the body, is conical, compressed; the lower jaw projects beyond the upper; the snout half the length of the head; mouth very large, although the maxillary does not extend far behind the orbit; the intermaxillary has 2 long, fang-like teeth, and 11 others less conspicuous but strong; the first and the fifth in the latter series are the strongest, the last the smallest. On the maxillary the teeth are visible only with the aid of a magnifying glass; the teeth upon the mandibles are similar to those upon the maxillaries, and are 14 in number on either side; the first two, separated from the following by an interval, are the strongest; the third, sixth, tenth, and eleventh are also conspicuous; the others, although shorter, are very robust; no teeth upon the palatines; fangs upon the tongue as strong as those in the jaws, 1 in front and 2 or 3 behind it. Diameter of the eye 11 times in the length of the head, interorbital space slightly less; length of barbel twice that of head, cylindrical, fringed at each end with 7 long threads, at the end of each of which is a small ball. Branchial opening broad; branchiostegal membrane supported by short rays, between which are luminous dots; a small luminous body, conspicuous on account of its light color, under the eye. Body absolutely scaleless, with numerous little, white, luminous dots in double series on each side of the belly; vent far back, distance frcm the snout equal to seven-tenths of length of body.

Dorsal and anal extend nearly to the base of the caudal; the length of the anal is one-third that of the body; it is inserted immediately behind the vent; length of the dorsal is scarcely half that of the anal; caudal very short, its length one-twentieth of that of the body; pectoral composed of 3 slender rays; ventrals inserted well behind the middle of the body, separated in two parts, the upper composed of 3 short rays, the lower of 4 rays, at least 4 times as long as the upper ones. Color, velvety black; iris, silvery white.

Radial formula: D. 21; A. 35; P. 3; V. 7.

A single specimen from a depth of 2,792 meters, near the Azores.

PHOTONECTES, GÜNTHER.

Lucifer, DÖDERLEIN, Wiegm. Archiv f. Naturgeschich., 1882, 26. (Preoccupied in Carcinology.)
Photonectes, GÜNTHER, Challenger Report, XXII, 1887, 212 (Type, *Lucifer albipinnis*, Döderlein, from Inosima).

Body compressed, rather long, scaleless; vent far behind the middle of the length. Head compressed, with short snout and exceedingly wide mouth. Teeth in the jaws small, unequal in size, in single series; vomer and palatine with a small group of teeth on each side. Eye small. Opercular portion of the head very narrow. A long hyoid barbel. The dorsal fin opposite the anal, which commences behind the vent. Pectorals none. Ventrals inserted behind the middle of the length. A small suborbital phosphorescent organ, and two series of luminous dots along the lower part of the sides, with numerous rudimentary similar organs scattered over the skin of the body. (*Günther.*)

Photonectes (=*Lucifer*, Döderlein) has been known heretofore from a single species, *P. albipinnis*, taken at Inosima, Japan.

PHOTONECTES GRACILIS, GOODE and BEAN, n. s. (Figure 137.)

A species much more slender than *P. albipinnis*. The type of this description is in very poor condition; the hyoid barbel is remarkably short and is probably imperfect. The fins, also, are incomplete, and the luminous dots along the sides are so indistinct as to be made out only with great difficulty. Its length, without including caudal, is 170 millimeters. The greatest height of the body (11 millimeters) is contained 15½ times in the length without caudal. The least height of the tail (2 millimeters) is nearly one-fifth of the height of the body. The greatest depth of the head (12 millimeters) equals the length of its postorbital portion. The snout is very short, nearly one-half as long as the eye. The posterior nostril is immediately in front of the eye, and the anterior is near the end of the snout and a little below the level of the posterior. Both are subcircular or oblong in shape, and the posterior has a small, narrow flap. The diameter of the eye (5 millimeters) is one-fourth the length of the head (20 millimeters). Below and behind the eye there is a luminous body, which is nearly as long as the eye and somewhat club-shaped. At the margin of the operculum there is a small, roundish, luminous dot. The maxilla is a very thin and narrow bone extending backward almost to the end of the head; it is very slightly curved and forms a very obtuse angle with the short intermaxilla. The mandible is very strongly curved upward, resembling a sled runner; its length (22 millimeters) equals twice the greatest height of the body. Both jaws are armed with numerous fine teeth of unequal size; only 3 remain on each side of the intermaxilla. The maxilla has 20 true teeth on its anterior half, and the posterior half has about 16 serræ. There are about 35 teeth on each side of the mandible. All the teeth of the jaws rake inward and backward, and are depressible. Three teeth on each side of the head of the vomer, increasing in size backwards. A pair of teeth on each palatine bone. One fang near the tip of the tongue and 3 farther back. Four gills, a small slit behind the fourth. The gill laminæ not well covered by the operculum. Gill rakers very few, minute, and spine-like. Gill opening very wide, the membrane cleft almost down to the origin of the hyoid barbel. No pseudobranchiæ. The hyoid barbel is situated nearly under the tip of the tongue; it is evidently imperfect, its length being scarcely one-half that of the eye.

The length of the head (20 millimeters) is contained 8½ times in length to base of caudal. The origin of the dorsal is at a distance from the caudal base (44 millimeters), a little more than one-fourth of the standard length. The length of the dorsal base (34 millimeters) is one-fifth of the standard length. The longest dorsal ray is a little longer than the eye.

The anal begins immediately under the dorsal, and its base is slightly longer than that of the dorsal; its rays are about as long as those of the dorsal. The distance from the end of the anal to the origin of the middle caudal rays (10 millimeters) equals one-half the length of the head. The distance of the ventral from the tip of the snout (87 millimeters) is a little more than one-half of the standard length; consequently the origin of the ventral is very slightly nearer to the root of the caudal than the tip of the snout. The distance from the origin of the ventral to that of the anal slightly exceeds the length of the anal base. Caudal and ventral imperfect. Pectoral wanting.

Radial formula: D. 18; A. 21; V. 7; P. 0.

Color, very dark. A row of luminous dots along the margin of the branchiostegal membrane; two rows beginning on the isthmus and extending back along the edge of the belly, passing between the ventrals and slightly above the base of the anal, disappearing near the end of the body; another row higher up on the side, which cannot be traced back farther than the origin of the ventral, on account of the bad condition of the specimen.

This specimen was obtained by the steamer *Blake*, at station XL, off Martinique, in 472 fathoms.

Family MALACOSTEIDÆ.

Malacosteidæ, GILL, Arr. Families of Fishes.

Body elongate, compressed, scaleless. Mouth immense. Snout very short. Cleft of the mouth exceedingly wide, the ends of the jaws extending beyond the root of the pectorals, and the jaws not connected with the sides of the head back of the orbit. Tail diphycercal. Lateral margins of the upper jaw formed by the intermaxillaries only. No adipose fin. No barbel. Pectorals rudimentary.

PROVISIONAL KEY TO THE GENERA.

A. Pectorals present .... MALACOSTEUS

B. Pectorals absent.
  1. Palatines smooth .... PHOTOSTOMIAS
  2. Palatines toothed .... THAUMASTOMIAS

MALACOSTEUS, Ayres.

Malacosteus, AYRES, Journ. Bost. Soc. Nat. Hist., 1849, 53.—GÜNTHER, Cat. Fish. Brit. Mus., v, 428.

Body elongate, compressed, scaleless. Head rather compressed, the snout very short, the cleft of the mouth very wide, extending to behind the root of the pectorals. Teeth pointed, unequal, in single series on both jaws and tongue; none on the palate. Opercula membranaceous. Dorsal far back, opposite anal. Pectorals rudimentary. Ventrals rather posterior. No barbel. (*Ayres*, *Jordan* and *Gilbert*.)

KEY TO THE SPECIES.

A. Dorsal and anal moderate (D. 19; A. 20). Loral spot longer than eye ....MALACOSTEUS NIGER
B. Dorsal and anal short (D. 15; A. 15). Loral spot shorter than eye ....M. CHORISTODACTYLUS

MALACOSTEUS NIGER, AYRES. (Figure 138.)

Malacosteus niger, AYRES, Journ. Bost. Soc. Nat. Hist., 1849, 53.—GÜNTHER, Cat. Fish. Brit. Mus., 1864, V, 428.—GOODE and BEAN, Bull. Essex Institute, 1879.

A *Malacosteus* with a somewhat slender body, its height about one-eight of its length, without caudal; with large branchial opening, and with comparatively long dorsal and anal fins, nearly opposite (the dorsal slightly in advance), falcate, strong. Luminous body almost crescentic, its length greater than diameter of eye. Fangs shorter than diameter of eye. Ventrals shorter than base of dorsal. Black, with numerous light dots over entire body.

Radial formula: D. 19; A. 20 (?); P. 3 (?); V. 5.

For a long time only a single specimen of this species was known, the type of Ayres's description, 8½ inches in length, which was picked up at sea in 40° N. lat., 50° W. lon. The *Blake* obtained a single specimen at Station CXLV, off Barbados, at a depth of 347 fathoms. The *Albatross* obtained several specimens: No. 35526, U. S. N. M., from station 2211, in 39° 35′ N. lat., 71° 18′ W. lon., at a depth of 1,064 fathoms; No. 32169, U. S. N. M., (No. 797, Gloucester donation); No. 39220, U. S. N. M., 6½ inches in length, in 37° 46′ 30″ N. lat., 73° 56′ 30″ W. lon.; a specimen from station 2,584, in 39° 05′ 30″ N. lat., 72° 23′ 20″ W. lon., at a depth of 541 fathoms.

Günther has described a species very closely related under the name of *Malacosteus indicus* (Challenger Report, XXII, 214, pl. LIV, fig. B.), from near the Philippines, 500 fathoms, and in the Andaman Sea (*Alcock*) 650 fathoms.

MALACOSTEUS CHORISTODACTYLUS, VAILLANT. (Figure 139.)

Malacosteus choristodactylus, VAILLANT, Exp. Sci. Travailleur et Talisman, XXII, 1888, 108, pl. VIII, fig. 4.

A *Malacosteus* with a comparatively stout body, its height nearly one-fourth of its length, its thickness six one-hundredths of same, with immense branchial opening by the extent of which the length of the head is seemingly reduced to one-eighth of the length of the body, and with comparatively short dorsal and anal fins inserted nearly opposite each other, apparently rounded and not falcate; caudal fin very small; luminous body under eye subquadrangular, its greatest length less than the diameter of the eye; ventrals longer than base of anal, much longer than base of dorsal; the longest ray apparently equal to the distance from insertion of anal to the end of middle caudal rays; length of strongest fangs greater than diameter of eye. Black, apparently without small luminous dots upon the body.

Radial formula: D. 19; A. 20; C. 12+; P. 5; B. 6.

This species was described by Vaillant from three specimens, two from the coast of Morocco in 1,400 to 1,635 meters and one from the Azores in 2,220 meters. The species is very distinct from *M. niger* and easily recognized.

PHOTOSTOMIAS, Collett.

Photostomias, COLLETT, Bull. Société Zoologique de France, 1889, 291.

A genus allied to *Malacosteus*, characterized by the absence of pectoral and adipose dorsal fins, and the absence also of teeth upon the palatines. The body is compressed, skin naked; ventrals in advance of the middle of the body; vent behind the middle of the body; opercula rudimentary. A series of long, crooked teeth in the intermaxillary; teeth upon the lingual and pharyngeal bones, but absent upon the vomer. Two post-orbital photophores. Two rows of photophores along the sides of the belly, and a great number of small luminous points scattered over the entire surface of the body. Type, *P. Guerni*, Collett.

PHOTOSTOMIAS GUERNEI, Collett. (Figure 140.)

Photostomias Guerni, Collett, Bull. Soc. Zool. France, 1889, 291.

The greatest height of the body, behind the ventrals, is included eight and a half times in its total length; the length of the head five and a half in total length. Eye moderate, its diameter contained five and a half times in the length of the head. Mouth slightly oblique, very large. Intermaxillary teeth about eight in number, those of the upper jaw very small and serrated. The dorsal and anal are very far back, opposite. Ventrals elongate, villiform, extending behind the vent. Caudal much furcate.

The anterior luminous organ above the maxillary is rudimentary.

Radial formula: D. 24; A. 27; P. O.; V. 15; C. 27.

Color, dull black, this color extending even into the inside of the mouth.

The type of this species, a single specimen, a female containing eggs nearly mature, was taken on the 30th of June, 1887, by the *Hirondelle*, at a depth of 1,138 meters, off the Azores, in 38° 34′ 30″ N. Lat., 30° 43′ 30″ W. Long. The species is named in honor of Baron Jules de Guerne, of Paris, who accompanied Prince Albert of Monaco on the *Hirondelle*, in the capacity of zoologist.

THAUMASTOMIAS, Alcock. (Figure 141.)

Thaumastomias, Alcock, Ann. and Mag. Nat. Hist., 1890, II, 220, pl. VIII, fig. 7.

A genus allied to *Photostomias*, from which it is distinguished by the presence of teeth upon the palatines. Body elongate, compressed, scaleless, with the vent not far distant from the caudal fin. Head compressed, with the cranium small, the snout short, and the cleft of the mouth exceedingly wide. A long, elastic muscular band passing from the hyoid bone to the inner aspect of the mandibular symphysis. Teeth acute, unequal, in single series in premaxillæ, mandibles, and palatines; none on the tongue. Eye moderate. Gill-covers rudimentary. One dorsal fin opposite to the anal, situated in the posterior fourth of the body near the caudal. No pectoral fins. Ventral fins situated in the anterior half of the body. Gill-openings very wide. No air-bladder.

The type of this genus, *T. atrox*, Alcock, was taken off the coast of Madras, at a depth of 1,310 fathoms, by the *Investigator*, station 97.

Family ALEPISAURIDÆ.

Alepidosaurina, Günther, Cat. Fish. Brit. Mus., V, 1861 (group third in family *Scopelidæ*).

Alepisauroidei, Bleeker, Enum. Sp. Pisc. Arch. Ind., XXII, 1859, 22.

Alepidosauridæ, Bonaparte, Cat. Metod., 1846, 8; Conspectus, 1850.—Adams, Man. Nat. Hist., 1854, 99.—Gill, Arrangement Families of Fishes, 1862, 16 (Family No. 161).—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 274.

Alepidosauroidæ, Gill, Proc. Acad. Nat. Sci. Phila., XVI, 1864, 187.

Alepisauridæ, Gill, Science, III, 620, 1884.

Sphyrænidæ, gen., Lowe, Trans. Zoöl. Soc. London, 1835, 123.

Malacopterygians with the mesocoracoid wanting or atrophied. Post-temporal impinging upon occiput. Vertebræ and interspinous processes normal. Photophores and barbel absent.

Body elongate, compressed, scaleless. Snout produced, the mouth cleft very wide. Premaxillary very long and slender, not protractile, forming entire margin of upper jaw. Maxillary thin, long, immovable.

Teeth very unequal, immovable; a series of small teeth occupying entire length of premaxillary; those in front sometimes larger and curved. Palatine teeth triangular, pointed. Teeth on lower jaw like those on palatines. Tongue toothless.

Gill membranes not united, free from isthmus. Gill rakers short, spine-like. Branchiostegals 5-7. Pseudobranchiæ large. Opercular bones thin, membranaceous. *Dorsal fin very long, occupying nearly the whole of the back;* adipose fin present; anal fin moderate; caudal forked. Air bladder none.

ALEPISAURUS, Lowe.

Alepisaurus, LOWE, Proc. Zoöl. Soc. London, 1833, 104; Trans. Zoöl. Soc., I, 124.—CUVIER and VALENCIENNES, Hist. Nat. Poiss. XXII, 529.—GÜNTHER, Wiegmann's Archiv, 1860, 121.
Alepidosaurus, GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 420.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 275.
Plagyodus, GÜNTHER, Annals and Mag. Nat. Hist., 1867; Challenger Report, XXII, 1887, 203.—JORDAN, Cat. Fishes, N. America, 1885, 39.

Body elongate, compressed, scaleless; head compressed; snout produced; mouth cleft wide; premaxillary long and slender; maxillary thin, long, immovable. Teeth unequal, immovable. Very small teeth run along entire length of intermaxillary. Palatine teeth compressed, pointed, the two or three anterior ones very strong and long, and the posterior ones moderate. Teeth in lower jaw similar to those on the palatine bones, one pair in front and two or three pairs in the middle much enlarged. Eye large. Pectoral and ventral fins well developed. Adipose fin of moderate size. Caudal forked. Gill opening very wide. Branchiostegals, V–VII.

The name *Plagyodus*, Steller (Pallas, Zoogr. Ross. Asiat., III, 383), has been adopted by Dr. Günther,[*] but it is doubtful whether Steller used the name *Plagyodus* in the sense of a Linnæan genus.

The following discussion of this genus is quoted from Günther's great work:

"Like most other deep-sea fishes, *Alepidosaurus* has been found at widely distant localities, and it is probable that in time it will be obtained in the intermediate parts of the ocean. Deep-sea fishes are much less subject to differences of climate than those inhabiting the coasts or the surface, and therefore we should not be surprised to find the representatives of one and the same genus, and frequently even the same species, in high latitudes of the northern and southern hemispheres.

"Every part of the *Alepidosauri* is so fragile that it is extremely difficult to obtain perfect specimens. It is also impossible to preserve them in spirits without some portion of the dorsal and of the other fins being broken. The entire structure of the dorsal fin is so delicate, that it must even be liable to injury and alteration of outline while the fish is in its native element. The fibrous ligaments connecting the vertebræ are very loose and extensible, so that the form of the fish is easily lengthened when its body is slightly stretched. Therefore no reliance whatever is to be placed on trivial specific distinctions founded on the form of the dorsal fin and on the relative proportions of the head and body. A comparison of the two figures of *A. ferox*, given by Lowe, will show the truth of this observation.

"The loose connection of the single parts of the body is found in numerous deep-sea fishes, and is merely the consequence of their withdrawal from the pressure of the water to which they are exposed in the depths inhabited by them. When within the limits of their natural haunts, the osseous, muscular, and fibrous parts of the body will have that solidity which is required for the rapid and powerful movements of a predatory fish. That the fishes of this genus belong to the most ferocious of the class is proved by the dentition and the contents of their stomach; but it is worthy of notice that although the mouth is so deeply cleft, the lower jaw can not be moved from the upper at a greater angle than about 40 degrees. The teeth are constantly changing and it is odd that an ichthyologist like Lowe should have had so much difficulty in recognizing the nature of some immature teeth lying in the gingiva."

P. Poey has described a specimen from Cuba, under the name of *A. altivelis* (Poey, Mem. Hist. Nat. Cuba, II, 302), and also referred to another form, which Gill has named provisionally *Caulopus Poeyi* (Proc. Acad. Nat. Sci., Philad., 1862, p. 131).

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[*] Description of a New Genus of Acanthopterygian Fishes. By the Rev. R. T. Lowe, B. A., Corr. Memb. Z. S. (In a letter to the Secretary.) < Trans. Zool. Soc., London, v. I. pp. 123–128, pl. XIX, 1835.

Additional Observations on Alepisaurus ferox. By the Rev. R. T. Lowe, M. A., C. M. Z. S. < Trans. Zool. Soc., London, v. I. pp. 395–400, pl. LIX, 1835.

[†] On *Alepidosaurus*, a Marine Siluroid Fish. By Dr. Albert Günther. < Ann. and Mag. Nat. Hist., Series III, v. VI, 150–1.

Günther, A. On the identity of *Alepisaurus* (Lowe) with *Plagyodus*, Steller. Ann. and Mag. Nat. Hist., London, March, 1867.

Gill has also described a species from the Pacific coast of North America, under the name of *Caulopus borealis* (Proc. Acad. Nat. Sci., Philad., 1862, p. 128); and Bean another, *Alepisaurus æsculapius* (Proc. U. S. Nat. Mus., 1883, 361); and there is also the doubtful *Caulopus serra* of Gill from Monterey, California.

We are not thoroughly satisfied that more than one species has been found in the Atlantic.

KEY TO THE GENERA AND SPECIES.

Ventral rays 7–10 .... ALEPISAURUS
  Paired fins moderate. (Ventrals about one-half length of head.) Ventral rays 9–10.
    ALEPISAURUS FEROX
  Paired fins short. (Ventrals about one-third length of head.) Body shorter posteriorly. Ventral rays 7.
    ALEPISAURUS ÆSCULAPIUS, Bean (from abyss off Unalaska).
Ventral rays 13 .... CAULOPUS
  Paired fins moderate. (Ventrals about one-half length of head.) Dorsal much elevated.
    CAULOPUS ALTIVELIS

  Paired fins elongate. ("Ventrals as long as head".) Dorsal fin short; 31 rays.
    CAULOPUS BOREALIS

ALEPISAURUS FEROX, Lowe. (Figure 142.)

Alepisaurus ferox, LOWE, Proc. Zoöl. Soc. London, 1833, 107.—Trans. Zoöl. Soc. London, I, 124, pl. XIX; 395, pl. LIX.—GÜNTHER, Wiegmann's Archiv., 1880, 121.
Alepidosaurus ferox, GÜNTHER, Cat. Fish. Brit. Mus., V, 421.
Plagyodus ferox, GÜNTHER, Challenger Report, XXII, 203.—JORDAN, *loc. cit.*
Alepisaurus azureus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 1839, 530.

Length of the head is less than twice the height of the body, and rather less than one-sixth of the total. Eye median, contained 5 to 6 times in length of head, as wide as the interorbital space. Dorsal fin much elevated; pectorals elongated, equal in length to the head, but reaching nearly two-thirds of the distance to the insertions of the ventrals; first rays of dorsal, pectoral, and ventral serrated.

Radial formula: D. 38–44; A. 14–17; P. 14–15; V. 9–10.

A. ferox was first described from specimens obtained by Lowe in the deep waters near Madeira. In addition to Lowe's types, and a few other specimens obtained by the Madeira fishermen upon tne deep-sea lines, the species appears not to have been captured, except in the Western Atlantic.

From the Western Atlantic specimens have been sent to the National Museum. Of three of these the locality is not known, but they were obtained in the New York markets by Mr. E. G. Blackford, and forwarded to Washington by him. The *Albatross* obtained one at the surface (Cat. No. 25262 U. S. N. M.) in 44° 30′ N. Lat., 57° 13′ W. Long., and another (Cat. 22292 U. S. N. M.) at a depth of 195 fathoms in 42° 45′ N. Lat., 63° W. Long. The Gloucester fishermen obtained two on Le Have Bank, one (No. 24245) at 275 fathoms, another (No. 24244) at 120 fathoms; also, two others (Nos. 24296 and 24297) in 200 fathoms at Lat. 42° 37′ N., Lon. 62° 55′ W., and another (No. 24243) in Lat. 43° 46′ N., Lon. 61° 18′ W. in 200 fathoms. A skull of *Alepisaurus*, from Van Diemen's Land, preserved in the British Museum, has been provisionally identified by Günther with those species, but it seems scarcely safe to regard *A. ferox* as an inhabitant of the Australian seas until more material has been obtained for study.

A closely allied species, with somewhat shorter paired fins, has been described by Dr. Bean under the name of *A. æsculapius*. The fish was speared at Unalaska in October, 1880, just as it was swimming upon the beach. It undoubtedly had come to the surface from the deep adjacent to Captains Harbor, where it was captured. The hundred-fathom line at this point approaches rather close to the shore. This individual had in its stomach twenty-one individuals of the spiny lumpfish. It was Dr. Bean's opinion that it had been driven ashore by the torture of a parasitic worm found in its flesh. The "Wolf Fish", as it is called in this region, frequently is stranded on the beach at Iliuliuk.

ALEPISAURUS (CAULOPUS) ALTIVELIS, Poey.

Alepisaurus altivelis, Poey, Mem. Hist. Nat. Cuba, II, 1858, 302.
Alepidosaurus altivelis, Günther, *loc. cit.*, and in Challenger Report, XXII, 203.

Length of the head is more than twice the height of the body, and contained 6¼ times in the total (with the caudal). Dorsal fin much elevated; pectoral elongate, but terminating at a great distance from the ventral; ventral about half as long as the head. Caudal lobes equal in length.

Radial formula: D. 40; A. 17; P. 16; V. 13.

The type of this species was about 3 feet long, and was obtained by Cuban fishermen at a great depth. Poey had another form, somewhat different, since described by Gill under the name *Caulopus Poeyi*.*

Family PARALEPIDIDÆ.

Paralepidina, Günther, Cat. Fish. Brit. Mus., v, 1864, 418 (group under *Scopelidæ*).
Paralepididæ, Gill, Arrangement, Families of Fishes, 1872, 16 (Family No. 162).

Body elongate, somewhat compressed, formed much as in a Barracuda, covered with cycloid scales of moderate or rather large size. Head long, usually scaly on the sides. Mouth very large, lower jaw projecting. Premaxillary not projectile, very long and slender, forming the entire margin of the upper jaw. Maxillary long and slender, closely adherent to the premaxillary. Teeth rather strong, pointed, in single series on the jaws and palatines; some of them on lower jaw and palatines sometimes very long and fang-like, and most of them freely depressible. Opercular bones thin. Pseudobranchiæ present. Gill membranes separate, free from the isthmus. Branchiostegals, about 7. Gill rakers short, sharp, spine-like. Eye large. Lateral line present, its scales usually enlarged. Dorsal fin short and small, behind the middle of the body, nearly or quite over the ventrals. Adipose fin present; anal fin low, rather long; caudal fin short, narrow, forked; pectorals rather small, placed low. Pyloric cæca none. No air bladder. Phosphorescent spots few or none. (*Jordan.*)

In this family are at present included six or more supposed species of pelagic fishes of small size, which are believed to occur only in the deep waters of the Atlantic and Pacific, which in structure recall to mind the genus *Alepocephalus*, but which in general appearance are more like *Sphyræna.* There are two groups.

Those of the *Sudis* type, which is distinguished by the presence of three or five very long, fang-like teeth on each side of the lower jaw, has not yet been found in the Atlantic Basin itself. *Sudis hyalina* of Risso has long been known from the Mediterranean. *S. ringens* of Jordan and Gilbert was collected by Jordan in 1880 in the Santa Barbara Channel, California.

The *Paralepis* type is represented by four species: one, *P. coregonoides*, from the Mediterranean, *P. sphyrænoides*, from the Mediterranean and also from Madeira; one, *P. borealis*, from the Arctic waters of North America, from the Gulf of St. Lawrence northward, and one, *P. coruscans*, very similar to the latter, and found under similar conditions in Puget Sound. It is probable that with more material the number of species may be considerably lessened. There are two species described from Nice which we have not been able to study, viz., *P. Cuvieri*, Bonaparte, and *P. speciosus*, Bellotti. The types of the latter are said to be in Milan.

PARALEPIS, Risso.

Paralepis, Risso, Hist. Nat. Eur. Mérid., III, 1826, 472.—Günther, Cat. Fish. Brit. Mus., v, 418.

Head and body elongate, compressed, covered with deciduous scales, those of the lateral line being the largest. Cleft of the mouth very wide; maxillary developed, closely adherent to the intermaxillary. Teeth unequal in size, some in the mandible and on the palatine

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* Proc. Acad. Nat. Sci., Philadelphia, 1862, 128.

bones being rather larger than the others; they are arranged in single series, in the intermaxillary, mandible, on the palatine and pterygoid bones. Eye large. Pectoral fins well developed; ventrals small, inserted at a great distance from the pectorals, below or immediately behind or in front of the dorsal fin. Dorsal fin short, on the hind part of the body; adipose fin small; anal elongate, occupying the end of the tail; caudal emarginate. Gill opening very wide, the outer branchial arch beset with short, spine-like gill rakers; pseudobranchiæ well developed; branchiostegals, 7. Air bladder none. Pyloric appendages none.

PARALEPIS COREGONOIDES, RISSO.

Paralepis coregonoides, RISSO, Hist. Nat. Europe Méridionale, III, 1827, 472, pl. VII, fig. 15.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., VII, 510.—BONAPARTE, Icon. Faun. Ital., Pesc., fasc., XXVII, fig.—GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 418.

Body elongate, its height contained about 12 times in its length. Head compressed, its length nearly one-fourth of the length of the body. Snout long, conical; cleft of mouth moderate; maxillary rod-like, adherent to intermaxillary. Teeth in a single row in the intermaxillary, a few enlarged anteriorly; also on palatines and pterygoids. Eye large, its diameter contained 5 times in the length of the head. Ventral fin very short, inserted below the anterior part of the dorsal. Gill openings very large, free from the isthmus; gill rakers very numerous, minute. Color, silvery; slightly bluish upon the back; blackish upon the belly on account of the transparency of the black peritoneum. Along the lateral line there are some blackish dots. The iris is silvery; the pupil blackish, silvery.

Radial formula: D. 10; A. 23; P. 13; V. 9.

This form is rare in the Mediterranean, but has been found in the waters of Liguria. The *Albatross* obtained a specimen (No. 37860, U. S. N. M.) from station 2393, in 28° 43′ N. lat., 87° 14′ 30″ W. lon., at a depth of 525 fathoms.

PARALEPIS SPHYRÆNOIDES, RISSO.

Paralepis sphyrænoides, RISSO, Hist. Nat. Europe Méridionale, III, 1827, 473, pl. VII, fig. 16.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., VII, 510.—GÜNTHER, Cat. Fish. Brit. Mus., V, 418.

The length of the head is two-sevenths or one-fourth of the total, without caudal. Pectoral and ventral fins very short. Dorsal inserted behind ventral origin.

The brief diagnosis given above was derived by Günther from a specimen 7½ inches long, obtained at Madeira by J. Y. Johnson, Esq. Günther identifies this doubtfully with the Mediterranean forms described by Risso and others. The National Museum has specimens from Nice (No. 40060).

PARALEPIS BOREALIS, (REINHARDT), JORDAN and GILBERT. (Figure 143.)

Paralepis borealis, REINHARDT, Naturv. Mathem. Afhandl., VII, 115, 125.—GÜNTHER, Cat. Fish. Brit. Mus., V, 418.—GAIMARD, Voy. Scand., Atlas, Poissons, pl. XVI, B., fig. 1.
Arctozenus borealis, GILL, Proc. Acad. Nat. Sci., Phila., 1864, 188.
Sudis borealis, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 277.

A form with snout as long as rest of head, mandible included, its upturned tip fitting into an emargination of upper jaw. Pectoral and ventral fins small, the latter inserted behind the dorsal. Head, 4⅓; depth, 12.

Radial formula: B. 7; D. 10. A. 32; P. 11; V. 9.

This form was first described from Greenland, and has been obtained by the Gloucester fishermen from the stomachs of fish on the banks, as well as from the Gulf of St. Lawrence, where it was collected by Prof. Whiteaves.

Four specimens were obtained by the *Albatross* from station 2676, 407 fathoms, in fish stomachs; four from 2677, 488 fathoms. In all of these the teeth had disappeared, probably by the softening of the tissues.

Another species has been described from Cuban waters, unknown depth, by Poey. Since neither type nor illustration is at hand, the original description is here inserted.

PARALEPIS INTERMEDIUS, Poey.

Paralepis intermedius, Poey, Rep. Fis. Nat. Cuba, II, 1866-1868, 416.

"Cuvier habia colocado este género en los Percidios despues de las Picudas (Sphyrena), á las cuales se parece por la prolongacion de la cabeza y del tronco; pero Müller lo ha colocado con razon en una division de Malacopterigios, donde se encuentran nuestros *Lagartos*. El individuo que poseo es de 236 mil. visto una sola vez y pescado en Matanzas, donde me ha sido regalado por D. Francisco Jimeno, á quien la historia natural cubana debe notable auxilio, gracias á sus generosos é ilustrados esfuerzos, favorecidos por su posicion social. Cuerpo comprimido; altura en longitud, 17 veces; la cabeza, 5⅕; el ojo, en la cabeza, 6⅞, distante de la extremidad rostral, 3½; narices apróximadas al ojo. Los huesos del rostro son transparentes; la boca, aunque bien hendida, no alcanza á la vertical del ojo; su arco superior es compuesto por el intermaxilar, el maxilar, que es delgado, le es paralelo; las dos mandíbulas están igualmente adelantadas. El premaxilar tiene dos dientes caninos delanteros internos, y en su borde una serie de dientes sumamente pequeños, aproximados, la punta vuelta hácia atrás, en número como de 100. La mandíbula inferior lleva tambien de cada la lado dos caninos delanteros, y en el borde interno una docena de dientes largos, encorvados hácie adelante, los del medio mayores, todos con la cúspide escotada por detrás como un semi-hierro de lanza; estos alternan con una serie externa de dientes pequeños, cuya punta mira hácia atrás. No hay dientes vomerinos; los palatinos son largos y encorvados, principalmente los más adelantados, todos en una serie. El Sr. Jimeno me asegura que lo recibió en grande estado de frescura, antes de echarlo en el aguardiente; vino sin escamas y sin vestigio de ellas; una sola encontré, sin estar seguro de que le pertenezca, y era cicloidea del tamaño de la pupila. La línea lateral es ancha, y se señala por medio de elevaciones cutáneas, como si otras tantas escamas caducas hubieran allí estampado su huella. La ventral es pequeña, tan atrasada, que casi se inserta en la mitad de la longitud total; la insercion de la anal es á la mitad de la distancia que separa la base de la ventral de la caudal; la dorsal es pequeña, igual distancia de la ventral y de la anal; la caudal es corta y escotada. Todos los radios me parecen articulados; los radios de la dorsal son endebles, en número de 7 ú 8; las ventrales tienen 10 radios, la pectoral 15, la anal en número considerable, confundiéndose los últimos con los de la base caudal; no puedo descubrir una 2ª dorsal posterior, ni una adiposa, y creo que no existen. La abertura branquial está muy abierta; los radios branquióstegos son 8, pequeños, endebles; los arcos branquiales, 3. La lengua es aplanada, llevando de cada lado una serie de dientes sumamente pequeños. El color es de carne, mate en el tronco; la línea lateral plateada, lo mismo que los huesos operculares."

SUDIS, Rafinesque.

Sudis, Rafinesque, Caratteri di Alcuni Nuovi Generi, etc., 1810, 60 (type, *Sudis hyalina*, a Mediterranean form).—Günther, Cat. Fishes Brit. Mus., v, 419.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 277.

Head and body elongate, compressed, covered with deciduous scales. Cleft of the mouth very wide; maxillary developed, closely adherent to the intermaxillary. Teeth in a single series, unequal in size, some much larger in the lower jaw. Eye large. Ventrals small, inserted opposite, or nearly opposite, the dorsal. Dorsal fin short, on the hinder part of the body; adipose fin small; anal elongate, occupying the end of the tail; caudal emarginate. (*Günther.*)

SUDIS HYALINA, RAFINESQUE. (Figure 144.)

Sudis hyalina, RAFINESQUE, *loc. cit.*, BONAPARTE, Icon. Faun. Ital., Pesc. fasc., XXVII, fig.—GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 420.—CANESTRINI, Fauna d' Italia, Pesc., 127.
Paralepis hyalinus, CUVIER and VALENCIENNES, III, 361.

The height of the body is contained about 11 times in the total length (without caudal), that of the head 3½ times. Eye very far back, the cleft of the mouth not reaching to its anterior margin, which is distant 3½ times the diameter of the eye from the tip of the snout. The distance from the orbit to the margin of the operculum 1½ times its own diameter. The ventral is in front of the dorsal fin.

Radial formula: D. 10; A. 24; P. 12; V. 9.

This species has been found in the Mediterranean about Sicily, Naples, and the Ligurian coasts. It is sufficiently abundant to be considered a table fish. It has not yet been found in the Atlantic. An allied form, *S. ringens* (Jordan and Gilbert), was obtained in 1880, in the Santa Barbara Channel, California.

Family ODONTOSTOMIDÆ.

Odontostomidæ, GILL, MS.

Isospondylous fishes, characterized by oblong, compressed, naked body and head, wide mouth cleft, margin of the upper jaw formed by the premaxillaries only; curved teeth upon the intermaxillaries; large, curved, lanceolate, depressible teeth upon the mandible, vomer, and palatine bones. Eye very large, with orbital cavity expanded downwards. Pseudobranchiæ well developed. Air bladder none. Gill opening very wide.

ODONTOSTOMUS, Cocco.

Odontostomus, COCCO, Lett. su Alcun. Salmon, 1838, 32 (type, *O. hyalinus*, Cocco).
Odontostomus, GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 417.

Body oblong, compressed, naked; head large and thick; snout short; cleft of the mouth very wide; intermaxillary and maxillary bones very slender, the former with small, curved teeth of equal size; the lower jaw, the vomer, and the palatine bones armed with long, movable teeth, the points of which are lance-shaped. Eye large. Pectoral and ventral fins well developed; the latter are inserted below the dorsal, at some distance behind the base of the pectoral. Dorsal fin in the middle of the length of the body; adipose fin small; anal long; caudal forked. Branchiostegals, 8; pseudobranchiæ small.

ODONTOSTOMUS HYALINUS, Cocco. (Figure 145.)

Odontostomus hyalinus, COCCO, Lett. su Salmoni, 32, pl. 4, fig. 2.—BONAPARTE, Icon. Faun. Ital., Pesci., Fasc. XXVII, 1840, fig. LII.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 424.—GÜNTHER, Cat. Fish. Brit. Mus., V, 1864, 417.—Challenger Report, XXII, 200, pl. LII, fig. A.
Scopelus balbo, RISSO, Hist. Nat. Eur. Mérid., III, 466.

Body elongate and much compressed posteriorily; its height is contained 6 to 6½ times in its total length (without caudal); the length of the head 4½ times. The wide cleft of the mouth, which is oblique, extends far beyond the eye, but does not reach the angle of the preoperculum. The eye is contained 5 times in the length of the head. Mandible broad, not attenuated in front, projecting beyond the mouth. Teeth very large, depressible, the longest exceeding in length the diameter of the eye; the teeth are much compressed, sharp-edged in front and behind; those on the palate have their extremities bent forward. The origin of the dorsal is nearer to the extremity of the snout than to the root of the caudal; the fin is higher than long. Anal origin behind the vent, which is placed midway between the ventral and anal, and does not touch the vertical from the last dorsal ray. The anal is lower than the dorsal, ending close to the base of the caudal fin. Adipose fin small. Pectoral inserted very far down, truncated, not reaching to ventral. Ventral behind the origin of the dorsal, shorter than the pectoral, extending to vent.

Radial formula: D. 12; A. 34.

This species is known only from the Mediterranean, where it is very rare. The National Museum has a specimen (No. 40054, U. S. N. M.) from Nice, presented by the Royal Museum at Florence, which corresponds perfectly to Günther's description and figure, and also to those of Risso and Valenciennes. Canestrini appears to have seen a different type, which he described as having the dorsal one-half as long as the anal, instead of one-third (D. 14; A. 28). It is not impossible that this was another specific form.

OMOSUDIS, Günther.

Omosudis, GÜNTHER, Challenger Report, XXII, 1887, 201.

Body oblong, compressed, naked; head compressed; snout of moderate length; cleft of mouth very wide; intermaxillary and maxillary bones slender, the former with a series of very small teeth of equal size, only one or two anterior ones being somewhat enlarged; the lower jaw, the vomer, and palatine bones with a few very large and lanceolate teeth. Lower jaw broad, and, like the rest of the head, formed of very thin bone. The supraclavicle and post clavicles form a long rod extending from the occiput on each side downwards to the abdomen, and partly free, not covered by skin. Ventral fins inserted far behind the pectorals, below the origin of the dorsal. Dorsal fin behind the middle of the length of the body; adipose fin very small; anal fin long. Stomach very distensible. Branchiostegals, 8; pseudobranchiæ well developed; gills 4, with broad gill laminæ and very short gill rakers.

OMOSUDIS LOWII, GÜNTHER. (Figure 150.)

Omosudis Lowii, GÜNTHER, Challenger Report, XXII, 201, pl. LII, figs. *c*, *c*¹.

The length of the head is two-sevenths of the total length (without caudal); the greatest depth of the body immediately behind the head is one-fifth of the total length. The head is strongly compressed, with rather flat upper surface; snout somewhat pointed, rather longer than the eye, the diameter of which is one-third of the length of the head. The bones of the head are extremely thin, the operculum being smaller than the suboperculum, and separated by two or three ridges. The infraorbital ring is nearly membranaceous. Preoperculum terminating below in a forked point. Cleft of the mouth extending backwards to the angle of the preoperculum.

The dentition is truly formidable for so small a fish; the longest tooth is one anteriorly on the side of the mandible; in the British Museum specimens, only one is present either on the right or left of the jaw; its length is nearly one-third of that of the head. The next largest are those on the palate, where there are two on each side, besides several smaller ones. Smaller teeth are also implanted on the hinder part of the dentary bone. All the large teeth can be laid backwards.

A semicircular scale-like, osseous lamella of extreme thinness covers the lower part of the cheek, and is marked by very shallow, concentric striæ.

The singular bone which supports the side of the anterior part of the abdomen is styliform, slightly curved backwards. It starts from the top of the occiput and descends towards the median line of the abdomen, which it reaches behind the pectoral fin. It is composed of the two-pronged supraclavicle, which is fixed by ligaments to the occiput, and of three slender, needle-shaped postclavicles; the uppermost postclavicle is suspended by ligaments from the supraclavicle, as is also the clavicle. The rod lies immediately below the thin integument, and its lower portion is quite free.

The dorsal fin commences midway between the root of the caudal and the eye, and is composed of very feeble rays; the anal commences at some distance behind the dorsal and terminates not very far from the caudal. Caudal fin small, with a considerable number of basal rays above and below. Pectoral fins quite at the lower side of the body; ventral fins very small and partly coalescent.

Light brownish on the back, with numerous brown pigment spots on the sides; abdomen black. (*Günther.*)

Günther described this genus and species from a specimen 3½ inches long, obtained south of the Philippine Islands, at *Challenger* Station CCXIV, at a depth of 500 fathoms. He had previously obtained, in 1868, the specimen collected by Lowe at Magdalena. The *Albatross* obtained a single specimen from station 2302, in 28° 47′ 30″ N. lat., 87° 27′ W. lon., at a depth of 724 fathoms.

The capacity of this form for swallowing fishes greater in size than itself appears to be as great as that of *Chiasmodus*, as may be understood from an inspection of figure c' in Günther.

Family STERNOPTYCHIDÆ.

Sternoptychidæ, GÜNTHER, Cat. Fish. Brit. Mus., v, 1864, 384, (part group *Sternoptychina*).—GILL, Arr. Families Fishes, 1872, 15 (Family No. 153, name only); Proc. U. S. N. M., VII, 1884, 350.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 283.—JORDAN, Cat. Fish. N. Am., 46.

Malacopterygians with compressed ventradiform body, carinated contour, deeply and obliquely cleft and subvertical mouths, whose upper margin is constituted by the supramaxillaries as well as the intermaxillaries; branchiostegal arch near and parallel with lower jaw, scapular with an inferior projection, and with one or more of the neural spines abnormally developed, and projecting above the back in advance of the dorsal fin. (*Gill.*)

KEY TO THE GENERA AND SPECIES.

I. Body naked.
  Abdominal outline nearly continuous in a sigmoid curve, a single produced spike-like neural spine in front of the dorsal fin, and about 5 branchiostegal rays.......... STERNOPTYCHINÆ, Gill
    A. Teeth in the jaws in several series; dorsal fin with spinous dilatations.......... STERNOPTYX
      1. Height of body equal to length, without caudal.......... STERNOPTYX DIAPHANA
  Abdominal outline abruptly contracted in advance of anal, several produced neural spines constituting a uniform edge in advance of dorsal, and about 9 branchiostegal rays.......... ARGYROPELECINÆ, Gill
    A. Teeth in the jaws in a single series, minute.......... ARGYROPELECUS
      1. Tail spineless.
        a. Mandible with flat spine at its lower angle.
          i. Pectoral fin extending nearly to origin of anal.......... A. HEMIGYMNUS
          ii. Pectoral extending to ventral.......... A. OLFERSII
        b. Mandible without spine.......... A. D'URVILLII
      2. Double row of spines along side of tail.......... A. ACULEATUS
    B. Teeth in jaws long and recurved.......... STERNOPTYCHIDES
II. Body covered with large, thin, deciduous scales. Anterior spinous dilatation of dorsal fin lacking. POLYIPNINÆ
    A. Luminous organs much developed.......... POLYIPNUS

STERNOPTYX, HERMANN.

Sternoptyx, HERMANN, Naturforscher, XVI, 1781–2.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 412.—GÜNTHER, Cat. Fish. Brit. Mus., v, 386; Challenger Report, XXII, 169, pl. XLV, figs. D, D'.

Body much elevated and compressed, passing abruptly into a short and compressed tail, the angle made by the hind margin of the trunk and the lower edge of the tail being filled up by a broad fold of the integument, of peculiar transparent appearance, resembling thin cartilage. This fold bears the anal fin and is supported by interhæmal rays. The greater portion of the body is scaleless and covered with a silvery pigment. A series of luminous spots runs along the lower edge of the abdomen and is separated from that of the other side by a cartilaginous fold occupying the median line of the abdomen; another series runs on each side of the isthmus; a row of three above and behind the root of the ventrals, and another row of three above the vent. The luminous organs on the lower part of the tail consist anteriorly of a row of four, of which the first is prolonged along the back as a narrow band, terminating about the middle of the depth of the body in a globular black spot with a white center; posteriorly in front of the caudal rays there is another row of four small spots.

Pectorals well developed, close to the lower profile; ventrals small; pelvic bone with a bifid spine in front pointing forwards. The dorsal fin occupies the middle of the back and consists of a triangular bony lamella, very thin in front, but strengthened along its hind margin, and followed by several rays. Adipose fin absent, or represented by a very low membranous fringe of the dorsal margin of the tail. The anal fin is incompletely developed, extending from the vent to the root of the caudal fin, its rays being rudimentary, widely set, and scarcely free. Caudal fin broad and forked. Gill opening very wide, the gill membrane being attached to the isthmus. A luminous organ occupies the inner side of the operculum close to its end; another is placed at the anterior end of the ceratohyal, and, finally, a very large glandular mass is lodged on the upper edge of the anterior end of the clavicle. Gills 4; the branchial arches are long, not angularly bent, the branchial slits being closed by a membrane in their upper portion. Only a few of the gill rakers are prolonged, needle-shaped, and widely set, the others being quite rudimentary. Pseudobranchiæ present. (*Günther.*)

STERNOPTYX DIAPHANA, LOWE. (Figure 146.)

Sternoptyx diaphana, HERMANN, Naturforscher, 1781, XVI, 8, taf. 1, figs. 1 and 2 (bad), and XVII, 249 (cop. by WALBAUM, Artedi, III, tab. 1, figs. 1 and 2.—BLOCH, Syst. Ichth. ed. SCHNEIDER, 1801, 494, pl. 35).—CUVIER, Regno Anim. 2nd edit., pl. 13, fig. 1.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 415.—LOWE, Proc. Zoöl. Soc. London, 1843, 85.—GÜNTHER, Cat. Fish. Brit. Mus., v, 387; Challenger Report, XXII, 169–170, pl. XLV, figs. D, D′.—VAILLANT, Exp. Sci., Travailleur et Talisman, 102.

Sternoptyx Hermanni, LACÉPÈDE, Hist. Nat. Poiss. v, 613.

Height of the body equals distance between extremity of the snout and commencement of the tail. Tail very short. Interorbital space slightly concave. Posterior limb of preoperculum borders hind part of the orbit, and descends in a very oblique line, terminating in two points. Pectoral fin scarcely reaching to the ventrals, which are very small. (*Günther.*)

Radial formula: B. 5; D. 10–12; A. 12; P. 10; V 3.

This grotesquely shaped and interesting fish was first discovered in the West Indies in 1774 by Hermann.

It was described by him in 1781 in the *Naturforscher*. It was next observed in the mid-Atlantic in August, 1842, when Lowe obtained a specimen taken between Madeira and St. Marys, the southernmost of the Azores, about 80 miles to the southeast of the latter island, in a calm, smooth sea. It was among the rarest of fishes until the time of the *Challenger*, which upon its cruise around the world obtained quite a number of specimens in the mid-Atlantic, the Australian seas, and in various places in the South Pacific, and about the same time the vessels of the U. S. Fish Commission and Coast Survey began to obtain it in the western Atlantic. The manner of its occurrence has been very puzzling. Although two or three specimens were obtained at the surface, they were usually caught up in a dredge or trawl from 500 to 2,500 fathoms, and the peculiarities of its distribution have given rise to much speculation. A study of the list of specimens published in the Challenger Report would seem to indicate that the fish inhabits all depths from the surface downward. Dr. Günther is unable to accept this as an indication of that state of affairs, and is of the opinion that its frequent capture would seem to be only a proof of its abundance in all tropical seas and of the slowness of its movements, which prevent it from going out of the dredge or net. He believes that although it and *Argyropelecus* are pelagic fishes which live in shoals, it is possible that they may descend to or beyond the hundred-fathom line during the daytime. Why during the daytime only is hard to understand, and it seems to us perhaps judicious to admit that we do not know the conditions of its distribution as regards depth, and to wait for further information before forming any opinion. Dr. Günther has studied all of the *Challenger's* specimens carefully and has arranged them in groups with reference to the form of the body.

The numerous specimens collected by the *Challenger* differ not inconsiderably in the shape of the body, which, in some specimens, is much more oblique than in others; in the width of the upper surface of the head and neck, and, finally, in the size of the eye, which in a specimen 50 millimeters long is 8 millimeters wide, and in another specimen of the same length only 7 millimeters. Also the relative position of the luminous organs, which are congregated in groups, is subject to unimportant variations.

Two forms are recognized by Günther:

(1) In the first and more common (Fig. D) the eye is comparatively larger and its diameter more than the depth of the triangular space, which is formed by the margins of the preoperculum, of the jaws, and of the orbit; the upper part of the mouth is also conspicuously above the level of the lower margin of the orbit.

(2) In the second form (Fig. D′) the diameter of the eye is not longer than the depth of the triangular space described, and the upper part of the cleft of the mouth is on a level with the lower margin of the orbit.

Both forms occur in the Indo-Pacific as well as Atlantic, and seem sometimes to have been obtained on the same occasion; and as, moreover, intermediate forms occur which might be assigned to either of the two forms, it is evident that the differences mentioned are not of specific value.

Very young specimens, of 15 millimeters in length, were found by Günther already to possess all the characteristics of the adult.

Specimens of this species were taken by the *Blake*, from Station XXXV, off Santa Cruz, at a depth of 508 fathoms; from Station CCCXXIII, in 33° 19′ N. lat., 76° 12′ 30″ W. lon., at a depth of 457 fathoms; and from Station CCCXVI, in 32° 7′ N. lat., 78° 37′ 30″ W. lon., at a depth of 229 fathoms. Also by the *Albatross* from the following localities: Cat. No. 32668, U. S. N. M., from station 2003, in 37° 16′ 30″ N. lat., 74° 20′ 36″ W. lon., at a depth of 641 fathoms; cat. No. 33471, U. S. N. M., from station 2076, in 41° 13′ N. lat., 66° 00′ 50″ W. lon., at a depth of 906 fathoms; cat. No. 33563, U. S. N. M., from station 2101, in 39° 18′ 30″ N. lat., 68° 24′ W. lon., at a depth of 1686 fathoms; also specimens from station 2111 in 35° 09′ 50″ N. lat., 74° 57′ 40 W. lon., at a depth of 938 fathoms; station 2118 in 13° 32′ 40″ N. lat., 62° 54′ W. lon., at a debth of 690 fathoms; station 3553 in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; and station 2554 in 39° 48′ 30″ N. lat., 70° 40′ 30″ W. lon., at a depth of 445 fathoms. A single specimen (Cat. No. 26235, U. S. N. M.) was taken by the schooner *Guy Cunningham* off the Grand Bank at a depth of 150 fathoms.

Dr. Günther, after studying the specimens obtained during the voyage of the *Challenger*, reached the conclusion that its frequent capture at all depths from surface downward is only a proof of its abundance in all tropical seas, and of the slowness of its movements, which prevent it from getting out of the way of the dredge or net. He infers that, like *Argyropelecus*, it is a pelagic fish, which probably lives in shoals, as sometimes more than one example were obtained in the same haul, and that possibly it may descend to or beyond the 100 fathom line during the daytime. More information is needed upon all these points.

ARGYROPELECUS, Cocco.

Argyropelecus, COCCO, Giorn. Sci. Sicil., 1829, fasc. 77, 146; CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXII, 392.—GÜNTHER, Cat. Fish. Brit. Mus., v, 389; Challenger Report, XXII, 167.
Pleurothyris, LOWE, Fish. Madeira, 64.

Trunk much elevated and compressed, passing abruptly into the tail, which is narrow; body covered with a silvery pigment, without regular scales; series of luminous (phosphorescent) spots run along the lower side of the head, body, and tail. Head large, compressed, and elevated, with the bones thin, but ossified. Cleft of the mouth wide, with the lower jaw prominent. The margin of the upper jaw is formed by the intermaxillary and maxillary, both of these bones having a sharp edge, which is beset with a single series of minute teeth; lower jaw and palatine bones with a series of small, curved teeth. Eyes rather large, and, although lateral, directed upward and very close together. Pectorals well developed, ventrals very small. The humeral arch and the pubic bones are prolonged into flat, pointed processes, which project in the median line of the belly; a series of imbricate scutes runs from the humeral to the pubic bone, forming a sort of serrature along the belly. The dorsal fin is short and occupies about the middle of the length of the fish; it is preceded by the first commencement of the formation of a spinous dorsal, several neural spines being prolonged beyond the muscles, forming a triangular osseous plate. Adipose fin rudimentary; anal fin short; caudal forked. Gill opening wide; outer branchial arch extending forward to behind symphysis of lower jaw and with very long gill rakers; branchiostegals nine; pseudobranchiæ present; air bladder present. Pyloric appendages four. (*Günther.*)

ARGYROPELECUS HEMIGYMNUS, Cocco. (Figure 147.)

Argyropelecus hemigymnus, Cocco, in Giorn. Sc. Sic., 1829, fasc. 77, 146.—Bonaparte, Fauna Italica. Pesci. text.—Cuvier and Valenciennes, Hist. Nat. Poiss., XXII, 398.—Günther, Cat. Fish. Brit. Mus., V. 385.—Challenger Report, XXII, 167.—Vaillant, Exp. Sci., Travailleur et Talisman, 103.

Sternoptyx hemigymnus, Valenciennes in Cuvier Règne Animal, Ill., Poiss. pl. 103, fig. 3.—Goode and Bean, Bull. Mus. Comp. Zoöl. V, 10, 220.

Sternoptyx mediterranea, Cocco, in Giorn. Il Faro, 1838, IV, 7, fig. 2.—Bonaparte, Fauna Italica, Pesci. fasc. XXVII, figure.

Height of the body equals the distance between the gill opening and the caudal base; posterior angle of mandible and angle of the præoperculum, each with a small triangular spine; tail slender, without spines. Pectoral reaching nearly to insertion of the anal.

Radial formula: B. 9; D. 7–8; A. 11; P. 9; V. 5.

A. hemigymnus, is according to Günther, common in the Mediterranean and neighboring parts of the Atlantic, and frequently caught at night in the surface net. During the cruise of the *Porcupine* an adult example was obtained between Shetland and Faroe, at a depth of 180 fathoms. Günther concludes that this fish is of nocturnal habits, living during the day at a depth below the surface which varies according to circumstances. The French expedition obtained it in the Gulf of Marseilles in 1,060 meters; in the Gulf of Gascony in 741–1,534 meters; off the Canaries in 1,200 meters; off the coast of Portugal, in 950–1,100 meters, and off the coast of Morocco in 1,123 meters.

This form, though usually very rare in the Mediterranean, sometimes is found in such abundance that it is evident that in certain localities and depths it must be one of the commonest of forms. Giglioli obtained in September, 1878, at Messina, over seven hundred in three days, brought to the surface by the swift current passing through the Straits.

Two specimens of this species were obtained by the *Blake*, from Station CCCXV, in 32° 18′ 40″ N. lat., 78° 43′ W. lon., at a depth of 225 fathoms. One specimen (No. 31709, U. S. N. M.) was takenby the *Fish Hawk* from station 1112, in 39° 56′ N. lat., 70° 35′ W. lon., at a depth of 245 fathoms; and one by the *Albatross* from station 2117, in 15° 24′ 40″ N. lat., 63° 31′ 30″ W. lon., at a depth of 683 fathoms.

A species closely similar was taken by the *Investigator* in the Indian Ocean, station 118, in 103 fathoms. (Alcock, Ann. and Mag. Nat. Hist., 1891, II, 126.) It may be called *A. Alcocki.*

ARGYROPELECUS OLFERSII (Cuvier), C. and V. (Figure 148.)

Sternoptyx Olfersii, Cuvier, Règne Anim., 2d edit., II, 316, pl. XIII, fig. 2.—Düben and Koren, in Vet. Akad. Handl., 1844, 80, tab. 3, fig. [illegible]

Argyropelecus Olfersii, Cuvier and Valenciennes, XXII, 408.—Lowe, Proc. Zoöl. Soc., 1850, 247.—Günther, Cat. Fish. Brit. Mus., V, 380.—Vaillant, Exp. Sci. Travailleur et Talisman, 104.

Height of the body is equal to, or rather less than, distance between the shoulder and the root of the caudal fin; tail at its base, below the end of the dorsal fin, as high as long. Mandible with a short, flat spine at its posterior corner; angle of the preoperculum with a spine directed downwards; tail without spines. Pectoral fin extends to ventral. (*Günther.*)

Radial formula: B. 9; D. 9; A. 11; P. 10; V. 6.

This species, like the others just described, has hitherto been considered to be a pelagic, surface form, and has now and then been found as far north as the coast of Norway, and was taken by the French expedition off Portugal in 950 and 1,615 meters. The *Challenger* dredged a specimen 2¼ inches long, at a depth of 1,125 fathoms, at Station I, off Cape Finisterre.

Dr. Günther, discussing this occurrence, remarks: "The question arises whether the fish was really captured at this great depth, or whether it entered the dredge during its passage through the surface strata; and I am very much inclined to think that the latter took place. We have very little positive information as to the habits of these fishes, but we know that they are commonly obtained near the surface in mid-ocean; and from their structure we may infer that, like all deep, compressed fishes, they are slow swimmers, and that they can with ease maintain a free position in the water, without the necessity of a support, remaining as it were at a certain distance from the surface. This may be observed in a fish of our own seas with a similar elevated body, viz, the John Dory, in which, however, a rapid undulatory movement of the soft dorsal fin is almost unceasing. The great development of the luminous organs, combined with the large eyes, indicates the nocturnal habits of the fish, which would induce it to descend to a greater depth during the daytime. Also the firm structure of the bones disproves the bathybial habits of *Argyropelecus*."

The following specimens have been obtained by the steamer *Albatross:* Cat. No. 33296, U. S. N. M., from station 2043, in 39° 40′ N. lat., 68° 28′ 30″ W. long., at a depth of 1,467 fathoms; Cat. No. 33393, U. S. N. M., from station 2075, in 41° 40′ 30″ N. lat., 66° 35′ W. long., at a depth of 855 fathoms; Cat. No. 33495, U. S. N. M., from station 2063 in 42° 22′ N. lat., 66° 23′ W. long., at a depth of 144 fathoms; Cat. No. 33560, U. S. N. M., from station 2101 in 39° 18′ 30″ N. lat., 68° 24′ W. long., at a depth of 1,686 fathoms; Cat. No. 35467, U. S. N. M., from station 2195 in 39° 44′ N. lat., 70° 03′ W. long., at a depth of 1,058 fathoms; Cat. No. 35534, U. S. N. M., from station 2208 in 39° 33′ 71″ N. lat., 16° 15′ W. long., at a depth of 1,178 fathoms; Cat. No. 35561, U. S. N. M., from station 2209, in 39° 34′ 45″ N. lat., 71° 21′ 30″ W. long., at a depth of 1,080 fathoms; Cat. No. 38211, U. S. N. M., from station 2728, in 36° 30′ N. lat., 74° 33′ W. long., at a depth of 859 fathoms; Cat. 43855, U. S. N. M., from station 2717, in 38° 24′ N. lat., 71° 13′ W. long., at a depth of 1,615 fathoms (Sp. nova?); and a specimen from station 2565, in 38° 19′ 20″ N. lat., 69° 02′ 30″ W. long., at a depth of 2,069 fathoms. A single specimen was obtained from the Grand Banks by a Gloucester fisherman.

ARGYROPELECUS D'URVILLII, Cuvier & Valenciennes.

Argyropelecus d'Urvillii, Cuvier & Valenciennes, Hist. Nat. Poiss., XXII, 405.—Günther, Cat. Fish. Brit. Mus., V. 1864, 386.

The height of the body equals the distance between the gill opening and the root of the caudal; tail much higher at its base than in *A. hemigymnus;* mandible without prominent spine at its posterior corner; angle of the preoperculum with a spine directed downwards; tail without spines. The pectoral fin does not extend to the hind margin of the trunk. (*Valenciennes.*)

Radial formula: B. 9; D. 9; A. 10; P. 10; V. 6.

This form is known only from mid-Atlantic; it may possibly yet be found to be identical with *A. hemigymnus.*

ARGYROPELECUS ACULEATUS, Valenciennes.

Argyropelecus aculeatus, Cuvier & Valenciennes, Hist. Nat. Poiss., XXII, 406.—Günther, Cat. Fish. Brit. Mus., V. 1864, 386.

Argyropelecus acanthurus, Cuvier & Valenciennes, *loc. cit.*, 408.

The height of the body equals the distance between the posterior margin of the preoperculum and the root of the caudal; tail very slender. Mandible with a very obtuse spine at its posterior corner; preoperculum with a spine directed downwards. A double row of spines along the lower side of the tail. (*Valenciennes.*)

B. 9; D. 9; A. 14; P. 10; V. 7.

This form has only been found at sea off the Azores. It may probably prove to be a form of one of the better-known species.

STERNOPTYCHIDES, Ogilby.

Sternoptychides, Ogilby, Proc. Linnæan Society, New South Wales (2d ser.), III, 1313, 1888.

"Pseudobranchiæ present; head and trunk much elevated and compressed, the latter passing gradually into the moderately long pedicle; the margin of the upper jaw formed by the intermaxillary and maxillary, each of which bears a row of long, recurved teeth at a considerable distance from one another; mandible with a similar row, one of which on either side is much more developed; two series of phosphorescent spots along the lower side of the head, body, and tail."

The type species, *S. amabilis*, Ogilby, was described from three mutilated specimens picked up dead on the beach at Lord Howe's Island.

The following brief statement of diagnostic characters is given by Ogilby.

Height of body, three-fifths of total length. Least height of pedicle, about one-tenth of height of body. Length of snout, about one half of diameter of eye. Colors, silvery.

Radial formula: D. 5, 11–12; A. 13 (?); V. (?); P. 10 (?); C. 6, 18, 6 (?).

POLYIPNUS, Günther.

Polyipnus, GÜNTHER, Challenger Report, XXII, 1887, 170, (type, *P. spinosus*, from the surface near the Philippine Islands.)

Polyipnus differs from *Sternoptyx* in having the body covered with very large anterior scales and in lacking the anterior spinal dilatation of the anal fin. Its body is more regular in form, there being no deep indentation at the base of the tail; and there are other salient characteristics, chief among them the extraordinary development of the luminous organs in size and number, not less than 55 phosphorescent organs on each side.

The type of this genus is *Polyipnus spinosus* (Fig. 149), obtained by the *Challenger* between the Philippine Islands and Borneo at a depth of 250 fathoms (Günther, Challenger Report XXII, 170, pl. LI, fig. B.) and by the *Investigator* in the Bay of Bengal 188–240 fathoms. It differs from *Sternoptyx* in having the body a more regular shape, there being no deep indentation by which the tail is separated from the trunk, and in other characteristics described by Günther.

FAMILY IDIACANTHIDÆ.

Idiacanthidæ, GILL, MS.

Malacopterygians, with spiny processes from anterior portion of vertebræ projecting through the skin of the body. Pectorals absent. Body naked. Dorsal fin beginning in advance of the vent. (*Gill.*)

IDIACANTHUS, Peters.

Idiacanthus, PETERS, Monatsber. Acad. Wiss. Berlin, 1876, 846.—GÜNTHER (type, *I. fasciola*, Peters), Challenger Report, XXII, 215.

Bathyophis, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, 5th series, II, 181.

Body extremely narrow and elongate, snake-like, naked. Vent far behind the middle of the length of the body. Head large, compressed, with the snout of moderate length, and with the cleft of the mouth nearly as long as the head. Teeth in the jaws extremely large, numerous, of unequal size, depressible. Similar teeth on the tongue and on each side of the vomer. Eye rather small. Opercular portion of the head narrow. A long barbel anteriorly on the hyoid. The dorsal commences above the ventrals, and extends nearly to the anal; the anal also is long, commencing behind the vent. Pectorals none. Ventrals inserted before the middle of the body. A small phosphorescent organ above the middle of the upper jaw, and a series of small, luminous dots along each side of the abdomen and along the outer ventral ray. Similar organs on the tail. Gill openings extremely wide. (*Günther.*)

Idiacanthus fasciola, the type of the genus, was described from two small surface specimens in the Berlin Museum, from the seas north of New Guinea and Australia.

IDIACANTHUS FEROX, GÜNTHER. (Figure 151.)

Bathyophis ferox, GÜNTHER, Ann. and Mag. Nat. Hist. 1878, II, 181.
Idiacanthus ferox, GÜNTHER, Challenger Report, XXII, 216, pl. LII, fig. D.

Vent situated at the sixth eighth of the total length. Commencement of the dorsal fin opposite to the root of the ventrals. Black. D. 60; A. 45; V. 6. (*Günther.*)

The *Challenger* obtained one specimen, 8 inches long, at station 63, in the middle of the North Atlantic; depth, 2,750 fathoms.

Order LYOPOMI.

Lyopomi, GILL, American Naturalist, 1889 (Nov.), 1016.

Teleosts with the scapular arch constituted by the proscapula, postero-temporal and post-temporal, the post-temporal discrete from the side of the cranium, and impinging on the supra-occipital; the hypercoracoid and hypocoracoid lamellar, and the fenestra or foramen in the upper margin of the hypocoracoid; the mesocoracoid absent; the actinosts normal; the cranium with the condyle confined to the basi-occipital; the opercular apparatus characteristic, the preoperculum being entirely detached from the suspensorium, rudimentary, and connected only with the lower jaw; the operculum normally connected; the suboperculum enlarged and partly usurping the usual position of the preoperculum, in company with the suborbital chain, which is extended backwards toward the opercular margin; jaw bones complete and normal; palatines, entopterygoid, and ectopterygoid normally developed; the anterior vertebræ separate, and the ventrals abdominal.

Family HALOSAURIDÆ.

Halosauridæ, GÜNTHER, Cat. Fish. Brit. Mus., VII, 1868, 482.

Body covered with cycloid scales; head scaly; barbels none. Margin of the upper jaw formed by the intermaxillaries mesially, and by the maxillaries laterally. Opercular apparatus incomplete. Adipose fin none. The short dorsal belongs to the abdominal part of the vertebral column; anal very long. Stomach with a blind sac; intestine short; pyloric appendages in moderate number. Pseudobranchiæ none; air bladder large, simple; gill openings wide. Ovaries closed.

KEY TO THE GENERA AND SPECIES OF HALOSAURIDÆ.

I. Ventrals normal. No second dorsal fin.

A. Vertex covered with scales. Scales of lateral line scarcely enlarged. Snout obtusely rounded. Head without angular ridges. Anal comparatively high .... HALOSAURUS

1. Preoral portion of snout equal to half its length.

Height of body nearly equal to half length of head and one-seventeenth of total. Diameter of eye two-fifths postorbital portion of head and much greater than width of interorbital space. About 60 scales in lateral line in front of vent .... H. OWENII, Johnson

2. Preoral portion of snout less than half its length.

Height of body about one-third length of head and one twenty-fifth of total.

Diameter of eye nearly two-fifths of postorbital portion of head and equal to width of interorbital space. About 55 scales in lateral line in front of vent .... H. JOHNSONIANUS, Vaillant

Diameter of eye half length of postorbital portion of head (which is equal to that of snout), and much greater than width of interorbital space. About 67 scales in lateral line in front of vent .... H. GÜNTHERI, Goode and Bean

B. Vertex scaleless. Scales of lateral line enlarged, provided with photophores. Snout pointed. Head with prominent lateral ridges. Anal moderately high, its height one-third to one-fourth of that of dorsal .... ALDROVANDIA, Goode and Bean

1. Snout much produced (length equal to or greater than distance from eye to root of pectoral).

a. Preoral portion of snout exceeds half its length. Diameter of eye considerably less than width of interorbital space. Twenty-four scales in lateral line in front of vent.
A. ROSTRATA (Günther)

b. Preoral portion of snout nearly equals half its length. Diameter of eye equal to width of interorbital space. Twenty-nine scales of lateral line in front of vent.
[A. AFFINIS (Günther). South of Japan.]*

2. Snout moderately produced (its length not exceeding postocular portion of head).
  - a. Preoral portion of snout contained 3 times in its entire length. Diameter of eye one-half width of interorbital space (two-fifths postocular portion of head). About 26 scales in lateral line in front of vent .... A. MACROCHIR (Günther)
  - b. Preoral portion of snout 3½ in its length. Diameter of eye less than one-half width of interorbital space (5 in postocular portion of head) .... A. GOODEI (Gill)
  - c. Preoral portion of snout 3¼ in its length. Diameter of eye equal to width of interorbital space (3 in postocular portion of head). Dorsal origin far behind root of ventral. About 20 suboval scales in lateral line in front of vent........................ A. PHALACRUS (Vaillant)
  - d. Preoral portion of snout 4 in its length. Diameter of eye two-thirds width of interorbital space (= one-fourth postorbital length of head). Dorsal origin behind root of ventral. About 18 scales in lateral line in front of vent... [A. MEDIOROSTRIS (Günther). West of Philippines.]
  - e. Preoral portion of snout 2½ in its length. Diameter of eye exceeds width of interorbital space (=2¼ in postorbital length of head). Dorsal origin behind root of ventral. Eighteen to twenty scales in lateral line in front of vent. A slender species; its height 20¼ in total length .... A. GRACILIS (Goode and Bean)
  - f. Preoral portion of snout about 2 in its length. Diameter of eye equal to width of interorbital space (2½ in postorbital length of head). Dorsal origin over base of last rays of ventral. Twenty-seven scales in lateral line in front of vent. A stout species; its height 15¼ in total length.. A. PALLIDA (Goode and Bean)
  - g. Preoral portion of snout 2 in its length. Diameter of eye greater than the width of interorbital space (2½ in postorbital length of head). Scales of lateral line slightly enlarged. A slender species..........................[A. ANGUILLIFORMIS (Alcock). Gulf of Manaar.]

II. Ventrals united into a broad, flat flake. A rudimentary, keel-like second dorsal.
Vertex scaly. Scales of lateral line not enlarged. Snout elongate...........HALOSAURICHTHYS, Alcock
1. Snout produced, its lenth 3 times that of its preoral portion. Diameter of eye greater than width of interorbital space (2½ in postocular portion of head).
[H. CARINICAUDA, Alcock. Andaman Sea.]

HALOSAURUS, Johnson.

Halosaurus, JOHNSON, Proc. Zoöl. Soc. Lond., 1863, 406.

Body elongate, clothed with cycloid scales; belly rounded; tail compressed and tapering to a point. Snout projecting much beyond the mouth, which is nonprotractile and of moderate size, with the upper border formed by the premaxillary and maxillary bones, the former small, the latter of moderate size and not reaching beyond the eye, both dentiferous. Teeth in villiform bands, in the jaws, and on the vomer, palatines, and tongue. A short dorsal over the space between the abdominal ventrals and the long anal, which is coalescent with the caudal, the latter consisting of very few rays. Large gill openings. Branchiostegal membrane with numerous rays. Stomach cæcal; pyloric cæca in moderate number; a large air bladder. No pseudobranchiæ, no barbel nor adipose dorsal.

HALOSAURUS OWENI, JOHNSON. (Figure 152.)

Halosaurus Oweni, JOHNSON, P. Z. S. Lond., 1863, 406, pl. XXXVI, fig. 2.—GÜNTHER, Cat., VII, 428; Challenger Report, 1887, XXII, 236.

The type, from Madeira, 17½ inches long, was long the only specimen known.

Snout produced, its preoral portion being nearly one-half of its length. Eye rather large, the length of its diameter being two-fifths of the postocular portion of the head, and much more than the width of the interorbital space. The maxillary reaches the vertical from the front margin of the eye. The length of the head is more than its distance from the ventral fin, the base of which is entirely in front of and somewhat remote from the base of the dorsal. Pectoral fin with narrow base, very long, extending nearly to the root of the ventral. Scales of the lateral line scarcely larger than the others, without phosphorescent organs being visible in the only specimen known. Anterior portion of the dorsal fin covered with small scales; anal fin scaleless. Brownish, silvery on the abdomen. (*Günther.*)

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* From S. of Japan, *Challenger*, 565 fathoms, and Andaman Sea, *Investigator*, 1,000 fathoms. *H. Hoskynii*, Alcock, is probably the same.

Height, 14½ in total length. Head, 7½. Eye, 2 in snout, 5 in head, reaching to profile. Interorbital space less than long diameter of eye. Snout scaleless. Mouth moderate, not nearly reaching tip of snout. Dorsal fin over the space between ventral fins and vent. Longest dorsal rays (second and third) twice as long as the base of the fin. Pectorals scaleless, longer than ventrals. Ventrals scaly. Vent in anterior half of total length. No anal papilla. Base of anal scaly. Caudal consists of two hair-like rays. Lateral line very low down and disappearing posteriorly.

Radial formula: B. 14; D. 11; A. 191; P. 11; V. 10; scales, 14–ca. 170–6.

The first individual obtained was caught in February. It was a female with eggs, which were in two masses lying side by side, 5½ inches long, not covered with a sac. Pyloric cæca 12, small. Air bladder 5 inches long and with a delicate silvery coat. Intestine straight. Peritoneum black anteriorly, posteriorly with patches of black lines on a pale ground. (*Johnson.*) Two specimens (No. 34418, U. S. N. M.), one 16½ inches and the other 21 inches in length, were obtained by the *Albatross* at station 2181, in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms.

Others were obtained by the *Blake* at stations LXVII, 128–240 fathoms, and LXVIII, 243–458 fathoms, off Guadeloupe and Santa Lucia.

HALOSAURUS JOHNSONIANUS, VAILLANT. (Figure 153.)

Halosaurus Johnsonianus, VAILLANT, Exp. Sci. Travailleur et Talisman, 181, pl, xv, fig. 2, 2^a, 2^b, 2^c, 2^d.

This *Halosaurus* is very similar to the preceding, but does not appear to reach so large a size. The form is more slender, the height not exceeding one twenty-fifth of the total length; the body is cylindrical, but it should be remarked that we have not obtained a single example in a state of preservation comparable to that of certain individuals of the preceding species (*Halosaurus Oweni*).

The form of the head, the proportions of the muzzle, those of the eye and the interorbital space, the arrangement of the gill cover offer nothing distinctive. Moreover, if we may be able to judge, this last is not scaled; but on the temples and the upper part of the head scales are present without doubt.

The vent is very little behind the anterior third of the body and is distant from the end of the snout only 3 times the length of the head.

The origin of the dorsal is at a distance from the end of the snout equal to twice the length of the head. The pectorals do not reach nearly to the insertion of the ventrals, which is at a distance from the end of the snout less than twice the length of the head; the ventral is wholly in advance of the dorsal.

The coloration, although approaching that of *Halosaurus Oweni*, Johnson, shows certain differences. Each scale shows at its free extremity a black spot, forming a reticulation in check pattern. The dark scales of the lateral line form a pronounced band; finally, as in the following pages, the dark color of the branchial cavity is more extended on the scapular regions, extends across the gill covers and on the whole head. These characters, together with the accessory characters, are sufficient to distinguish this species from the preceding, to which it is nearly related.

Radial formula: B. 12; D. 1, 10; A. 186(?); V. 1, 8.

Total length of type (millimeters), 390. Height, 15.04. Thickness, 12.03. Head, 47.12. Snout, 22.47. Diameter of eye, 7.15. Interorbital space, 4.08.—*Vaillant.*

Ninety-six individuals are tabulated by Vaillant; the localities are off the Morocco coast, the Canaries, Soudan, and on Arguin Bank, the depths ranging from 834 to 2,115 meters.

HALOSAURUS GÜNTHERI, GOODE and BEAN, n. s.

Vertex scaly. Snout produced, its preoral portion contained 2⅓ times in its length. Eye large, its length equal to half that of the snout, half that of postocular portion of the head, and much wider than the width of the interorbital space, and contained 5 times in the length of the head. Maxillary reaching nearly to front margin of the eye. Length of the head is less than its distance from the root of the ventral, the origin of which is slightly in front of that of the dorsal, the origin of the dorsal being over the posterior portion of the root of the ventral, and also over the thirty-first scale in the specialized lateral line. Two scales between lateral line and origin of the ventral; ventral broad, the length slightly longer than that of longest dorsal. Pectoral fin moderate, extending less than half way from its own base to the root of the ventral, its length equal to half that of the head. Scales on the lateral line not much enlarged, 67 in advance of the vent. The base of the dorsal and anal scaly. Color brownish; under surface of head lighter.

Radial formula: D. 11; P. 16; V. 1, 9; L. trans. 15 | 5.

A single specimen was obtained by the *Albatross* from station 2722, lat. 39° 13′ N., long. 72° 1′ W., at the depth of 594 fathoms.

ALDROVANDIA, Goode and Bean, n. g.

Lyopomi, with ventrals normal; no second dorsal fin; vertex scaleless; scales of lateral line enlarged, provided with photophores. Head with pointed snout and prominent lateral ridges. Anal fin moderate, high; its height one-third to one-fourth that of dorsal. Type *Halosaurus rostratus*, Günther.

This genus is dedicated to Ulysses Aldrovandus, of Bologna, the founder of the first natural history museum, whose name, strangely enough, has never been honored by association with a genus of animals or plants.

ALDROVANDIA ROSTRATA, (GÜNTHER). (Figure 154.)

Halosaurus rostratus, GÜNTHER, Ann. and Mag. Nat. Hist., 1878 II, 252. Challenger Report, XXII, 241, pl. LIX, fig. D, 1887.

"The length of the head much exceeds the height of the body. The snout very much produced, spatulate, its preoral portion being more than one-half of its length. Eye of moderate size, its length being one-third of the postocular portion of the head, and considerably less than the width of the interorbital space. Maxillary scarcely reaching the front margin of the eye. The length of the head is a little more than its distance from the root of the ventral, which is nearly entirely situated before the dorsal. Nearly all the scales are lost, but some of the lateral line remain; they are much larger than the other scales; and on the tail, where the lateral line approaches the lower profile, these larger scales fill up all the space between the lateral line and the anal fin.

"Distance of the snout from the mouth, 8½ lines; distance of the snout from the eye, 1 inch 3 lines; distance of the snout from the root of the pectoral, 2 inches 7 lines; distance of the snout from the root of the ventral, 4 inches 10 lines; distance of the snout from the origin of the dorsal, 5 inches 8 lines; distance of the snout from the vent, 6 inches 11 lines; total length, 20 inches.

"Bones of the head very thin; operculum smooth, covered with a very fine membrane. The lower part of the side of the head is occupied from the snout to the gill opening by two exceedingly wide muciferous channels, of which one takes its origin on the preorbital, the other on the mandible, and which open behind at the gill opening by a common and very wide aperture. Branchial apparatus as in the other species. The dentition is very similar to that of *Halosaurus macrochir*, but the palatine patches are crescent-shaped and rather widely separated from the pterygoid band.

"The scales of the lateral line are about three times the size of the others, and about twenty-four in number between the gill opening and the vent. Each bears a luminous organ, vertically elongated and rhombic, but not extending to the upper and lower margins of the scales. Light color, the lower part of the head and the gill cover black; abdominal region blackish."

Radial formula: B. 9; D. 10; V. 9, 10; L. transv. 13 | 6.

The type, a single specimen, 22 inches long, is from the Mid-Atlantic Challenger station 63; depth, 2,750 fathoms.

ALDROVANDIA MACROCHIRA, (GÜNTHER). (Figures 155–155a.)

Halosaurus macrochir, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 251; Challenger Report, XXII, 1887, 237, pl. LIX, fig. A.

Halosaurus macrochir, GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 1883, 219.

Snout moderately produced, the preoral portion forming only one-third of its length. Eye rather small, one-fourth of the postocular portion of the head, and one-half of the width of the interorbital space. Maxillary reaching to the front margin of the eye. The length of the head is more than its distance from the root of the ventral, the origin of which is immediately in front of that of the dorsal. Pectoral fin with narrow base, very long, extending nearly to the root of the ventral. Scales of the lateral line larger than the others, more or less hidden in a pouch of black skin, with a phosphorescent organ at the base of the free portion. These large scales are continued for some length on the tail and cover the base of the anal fin, which, like the dorsal, is covered in its basal half with small scales. Uniform black.

The entire head is naked; only the upper portions of the gill cover and of the cheek are covered with scales similar to those of the body.

The band of intermaxillary teeth is broader than the maxillary band. Palatine teeth in two separate patches, each being of an oval shape, with the pointed end directed forwards; pterygoid teeth in a very narrow band, which extends far backwards in the cavity of the mouth; basibranchials with a long and broad band.

Four well-developed gills. Outer branchial arch with 14 widely-set gill rakers, of which the middle ones are slender and as long as the eye, the others becoming shorter towards the ends of the series.

Radial formula: B. 12; D. 13; V. 10; P. 11–13; L. transv. 14 | 5.

This form is common in the central parts of the Atlantic, where it was first discovered by the *Challenger*, off the Strait of Gibraltar, Station V; depth, 1,000 fathoms; one specimen, 21½ inches long. Near Marion Island, station 146; depth, 1,375 fathoms; four specimens, 18 to 20 inches long.

Specimens were also obtained by the *Blake*, at Station CCCVIII, in 41° 24′ 25″ N. lat., 65° 35′ 30″ W. lon., at a depth of 1,242 fathoms, and Station CCCXXV, in 33° 35′ 20″ N. lat., 76° 00′ W. lon., at a depth of 647 fathoms.

The *Albatross* secured specimens from the following localities: No. 33312, U. S. N. M. from station 2051, in 39° 41′ N. lat., 69° 20′ 20″ W. lon., at a depth of 1,106 fathoms; No. 33365, U. S. N. M., from station 2077, in 41° 09′ 40″ N. lat., 66° 02′ 20″ W. lon., at a depth of 1,255 fathoms; and also from station 2074, in 41° 43′ N. lat., 65° 21′ 50″ W. lon., at a depth of 1,309 fathoms; station 2534, in 40° 01′ N. lat., 67° 29′ 15″ W. lon., at a depth of 1,234 fathoms; station 2116, in 35° 45′ 23″ N. lat., 74° 31′ 25″ W. lon., at a depth of 888 fathoms; station 2140, in 17° 36′ 10″ N. lat., 76° 46′ 05″ W. lon., at a depth of 966 fathoms; station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms; station 2111, in 35° 09′ 50″ N. lat., 74° 57′ 40″ W. lon., at a depth of 938 fathoms; station 2106, in 37° 41′ 20″ N. lat., 73° 03′ 20″ W. lon.; station 2563, in 39° 18′ 30″ N. lat., 71° 23′ 30″ W. lon., at a depth of 1,422 fathoms; station 2562, in 39° 15′ 30″ N. lat., 71° 25′ W. lon., at a depth of 1,434 fathoms; station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms; station 2571, in 40° 09′ 30″ N. lat., 67° 09′ W. lon., at a depth of 1,356 fathoms; station 2564, in 39° 22′ N. lat., 71° 23′ 30″ W. lon., at a depth of 1,390 fathoms, and station 2533 in 40° 16′ 30″ N. lat., 67° 26′ 15″ W. lon., at a depth of 828 fathoms.

ALDROVANDIA GOODEI, (GILL.).

Halosaurus Goodei, GILL, Proc. U. S. Nat. Mus., VI, 1881, 257.

The snout is moderately produced, its preoral portion forming two-sevenths of its own length; the eye is small, equal to about one-fifth of the postocular portion of the head, and measuring a little less than one-half of the width of the interorbital space. The head is longer than the distance between it and the root of the ventral. The supramaxillary reaches the vertical of the front margin of the eye. The dorsal is entirely behind the ventrals; the anal commences as far behind the root of the ventrals as the latter is behind the preoperculum; the pectorals nearlv reach backward to the ventrals. The squamation is similar to that of the *A. macrochira.*

Radial formula: B. 12; D. I 10–11; V. I, 8.

The type of this description (No. 32281) was obtained by the *Albatross* at station 2037, lat., 38° 53′ N., lon., 69° 23′ 30″ W., at a depth of 1,731 fathoms. Others were obtained from stations 2051, 1,106 fathoms; 2035, 1,362 fathoms; 2052, 1,098 fathoms.

ALDROVANDIA PHALACRUS, (VAILLANT). (Figure 156.)

Halosaurus phalacrus, VAILLANT, Exp. Sci. Travailleur et Talisman, 185, pl. XV, fig. 3; pl. XVI, figs. 1—1c.

In appearance and in general proportions this species approaches the *Halosaurus macrochir* of Günther, being, however, a little more slender, so that the height is less than one-twentieth of the total length; the body is a little more compressed.

The head is one-ninth of the total length; it is equally depressed below and notably more elongate, so that the muzzle is spatuliform. The snout is three-sevenths of the length of the head, the preoral portion occupying its anterior third. The horizontal diameter of the eye equals the width of the interorbital space and is one-seventh of the length of the head. Scales on the operculum and the temporal region; upper part of the head naked.

The origin of the dorsal is at a distance from the tip of the snout equal to the length of the head. Pectorals not reaching to the insertion of the ventrals, which are at a distance from the gill opening notably less than the length of the head; the ventrals are short and placed in advance of the dorsal. This fish in the fresh state shows a flesh pink tint; the anal dusky, approaching to brown; the head bluish black. Total length (millimeters), 430; height, 20.04; thickness, 13.03; length of the head, 53.12; length of the snout, 24.45; diameter of the eye, 8.15; width of interorbital space, 8.15.

Radial formula: B. 10; D. 1, 9; A. 200; ? V. 1, 7.

The examples recorded by Vaillant are from off the coast of Morocco, Soudan, and the Azores, in depths ranging from 1,103 to 2,220 meters.

ALDROVANDIA GRACILIS, GOODE and BEAN, n. s. (Figure 157.)

This is a very slender species and resembles *H. rostratus*, from which it differs in having a larger eye, a smaller number of modified scales in the lateral line, and in having the vent placed more posteriorly. The description is made from the *Albatross* specimen taken at station 2380. The length of this individual is 490 millimeters. The greatest height of the body (24 millimeters) is contained 20½ times in the total length, and about 2½ times in the length of the head. The greatest width of the body (17 millimeters) is two-thirds of its greatest height. The length of the head (60 millimeters) is contained 8⅙ times in the total. The greatest width of the head (17 millimeters) equals the length of the maxilla. Distance from the end of the mouth to the tip of the snout (11 millimeters) equals nearly one-fifth the length of the head. The length of the snout (27 millimeters) is a little greater than the length of the mandible. The width of the interorbital space (7 millimeters) is about one-fourth the length of the snout and three-fourths the length of the eye. The maxilla extends to slightly beyond the anterior margin of the eye; the mandible a little behind the end of the eye. At present the head contains a few scales in several series behind the eye. The diameter of the eye (9 millimeters) is equal to one-third the length of the snout, and about two-fifths of the length of the postorbital part of the head. The mouth is rather large. Teeth on the intermaxillaries and mandible in somewhat broader bands than those on the maxilla. Vomerine patches broad, well separated in front. Tip of tongue free. Integumentary flap not extending much beyond the margin of the subopercle. Branchiostegals, 10; gill rakers, 2 above, 12 below, the longest scarcely half as long as the eye The distance of the dorsal from the tip of snout (122 millimeters) is twice the greatest length of the head. The length of the base (17 millimeters) is two-thirds of the height of the body. The longest ray is two-fifths as long as the head and nearly equal to the height of the body, about 34 rows of scales in front of the dorsal. The ventral is entirely in advance of the dorsal; its distance from the end of the head (49 millimeters) equal to the distance from the tip of the mandible to the end of the head. The length of the ventral (18 millimeters) is about equal to that of the dorsal base and twice the length of the eye. The origin of the ventral is about under the twenty-eighth row of scales. The distance of the vent from the origin of the ventral (66 millimeters) is greater than the length of the head; it is close to the anal origin. The distance from the dorsal origin to that of the anal (53 millimeters) equals 3 times the length of the dorsal base. Nine or 10 enlarged scales in the lateral line in front of the ventral origin and about the same number between the ventral and the vent.

The dorsal is scaly, less than one-half of its height; about 12 rows of scales between the dorsal origin and the lateral line, and only about two rows below the lateral line.

Scales silvery, the light orange-brown body color showing through them. Branchiostegal membrane bluish; inner surface of gill covers nearly black; inside of mouth bluish.

Three specimens are known, one obtained by the *Blake*, at Station LXX, off Guadaloupe, 769 fathoms; one at station 2380 by the *Albatross*, and another at station 2381 by the same vessel. Station 2380 is in N. lat. 28° 02′ 30″, W. lon. 87° 43′ 45″, from 1,430 fathoms. Station 2381 is in N. lat. 28° 05′ 00″, W. lon. 87° 56′ 15″, 1,330 fathoms.

It is not impossible that this species may be identical with *H. Johnsonianus* of Vaillant, but the types of the French naturalist were so much mutilated that his description is not sufficient to establish the relationship.

ALDROVANDIA PALLIDA, GOODE and BEAN, n. s. (Figure 158.)

Greatest height of the body at origin of the dorsal and is contained 15 times in the total length, and is about one-half the greatest length of the head, which is, including the subopercular flap, 78 millimeters, and contained about 7⅔ times in the total length. The greatest width of the body (21 millimeters) is a little more than one-half its greatest height. The greatest depth of the head (24 millimeters) is a little less than one-third of its length and nearly equal to its greatest width. The head is naked, with the exception of a patch of scales beginning behind the eye; its greatest width (10 millimeters) nearly equal to one-half the width of the body. The eye is midway between the tip of the snout and the end of the head. Its long diameter (11 millimeters) equal to one-third the length of the snout (33 millimeters), also equal to the width of the interorbital space. The nostrils are close to the front of the eye, the anterior in a short tube, which ends in a little pointed flap; the posterior larger, nearly elliptical in shape. The distance from the front margin of the mouth to the tip of the snout (16 millimeters) equals nearly one-half the length of the snout. The maxilla extends to below the front margin of the eye. Teeth in broad, villiform bands on the intermaxilla, mandible, and vomer; in narrower bands on the maxilla and palatines. End of the tongue barely free. The integumentary flap projecting beyond the margin of the suboperculum. The dorsal originates about over the end of the base of the ventral. Its distance from the tip of the snout a little more than twice the length of the head. The length of its base (23 millimeters) nearly equal to the greatest depth of the head. The basal half of the fin is profusely covered with scales; it consists of two simple and nine divided rays. The longest dorsal ray (30 millimeters) equals three-fourths the greatest height of the body. The last ray (12 millimeters) is two-fifths as long as the third. The ventral is distant from the snout a space about equal to twice the length of the head. It consists of two simple and seven divided rays; the longest ray (23 millimeters) equal to base of dorsal. The pectoral is placed above the middle of the body not far from the head. Its length (35 millimeters) equal to one-half the distance of its base from the origin of the ventral; it reaches to about the seventeenth row of scales. The vent is under the sixty-third scale of the lateral line; there are about 12 rows of scales between the origin of the dorsal and the lateral line and about 2½ rows between the lateral line and the origin of the ventral. The lateral line is composed of enlarged and modified scales, and becomes obliterated about the middle of the length of the tail. There are 15 or 16 of these enlarged scales between the head and the origin of the ventral; about 27 between the vent and the head. The distance from the origin of the ventral to the anus (73 millimeters) is nearly equal to the length of the head. The anal fin begins not far behind the vent and contains about 166 rays. The caudal, which is long and slender, contains about 4 rays; the pectoral 13. The membrane covering the anal rays is scaled throughout almost its entire length. Gill rakers rather short and few; three above the angle, twelve below.

The color of the scales is a light silvery gray, through which the body color appears as a light orange-brown. Branchiostegal membrane and opercular bones bluish. Inside of gill covers very dark blue.

A single individual, the type of the species, 600 millimeters in length, was taken by the *Blake* at Station CLXXIII, in 24° 36′ N. lat., 84° 05′ W. lon., at a depth of 955 fathoms.

Specimens were also obtained by the *Albatross*, as follows: No. 38140, U. S. N. M., from station 2729, in 36° 26′ N. lat., 74° 32′ W. lon., at a depth of 679 fathoms; No. 33379, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; No. 35418, U. S. N. M., from station 2181, in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms; No. 35551, U. S. N. M., from station 2216, in 39° 47′ N. lat., 70° 30′ 30″ W. lon., at a depth of 963 fathoms; No. 35638, U. S. N. M., from station 2231, in 38° 29′ N. lat., 73° 09′ W. lon., at a depth of 965 fathoms, and also from station 2381, in 28° 05′ N. lat., 87° 56′ 15″ W. lon., at a depth of 1,330 fathoms; station 2380, in 28° 02′ 30″ N. lat., 87° 43′ 45″ W. lon., at a depth of 1,430 fathoms, and station 2533, in 40° 16′ 30″ N. lat., 67° 26′ 15″ W. lon., at a depth of 828 fathoms.

HALOSAURICHTHYS, Alcock.

Halosaurichthys, ALCOCK, Ann. and Mag. Nat. Hist., 1889 (Nov.), 454; Bathybial Fishes of the Bay of Bengal, 30.

Halosaurids having body long and low, somewhat compressed. Scales of lateral line not enlarged. Tail long and tapering. Snout overhanging the mouth. Mouth narrow. Teeth villiform in broad bands on jaws and hyoid, forming a broad crescent in the prominent loose palatines and a short, narrow band in the pterygoids. A long, rudimentary second dorsal and a short first dorsal over axil of ventrals. Anal confluent with caudal. Ventrals united in a broad, flat plate.

A single species, *H. carinicauda*, represented by a single specimen taken by the *Investigator* in the Andaman Sea, 490 fathoms.

Order APODES.

Apodes, KAUP, Catalogue of Apodal Fishes in British Museum, 1856.—JORDAN and GILBERT, Bulletin XVI, U. S. Nat. Mus., 354.—GILL, Century Dictionary, 262.

Physostome fishes with the intermaxillaries atrophied or lost, the supermaxillaries lateral, and with scapular arch but slightly developed and free behind the cranium. No ventral fins. Symplectic bone lacking. Opercular apparatus and palatopterygoid arch but slightly developed. Scales minute or wanting. No pseudobranchiæ. Gill openings moderate. Air bladder (if present) with pneumatic duct. Vertebræ numerous. Vertical fins spineless, usually confluent at caudal.

ARTIFICIAL KEY TO THE DEEP-SEA FAMILIES OF APODES.

- I. Tongue with free margin, more or less broad.
  - A. Pectoral fins present.
    - 1. Gill openings distinct and separate.
      - a. Gill openings lateral. Scales present or absent.

* No scales. Jaws even. Teeth present or absent on vomer.........LEPTOCEPHALIDÆ
* Scales present, minute. Lower jaw projecting. Vomerine teeth ......[ANGUILLIDÆ]
b. Gill openings horizontal, inferior. Scales present. Lips obsolete, or nearly so.
* Snout obtuse. Jaws powerful. Teeth in jaws blunt, uniserial, with none on vomer. SIMENCHELYIDÆ
** Snout conical. Jaws moderately strong. Teeth sharp, in bands in jaws and on vomer. ILYOPHIDÆ
2. Gill openings inferior and confluent.
a. Head conical; tongue small.
* Posterior nostrils close to eye. Branchiostegals shortened......SYNAPHOBRANCHIDÆ
B. Pectoral fins absent.
1. Gill openings distinct, lateral. Scales wanting. Mouth oblique, with projecting lower jaw and short obtuse snout.
a. Body and tail very elongate. Teeth in bands in jaws and on vomer......HETEROCONGRIDÆ
II. Tongue narrow, not free. No scales.
Gill openings rather wide.
A. Pectorals strong.
1. End of tail normally surrounded by vertical fins. Skeleton firm. Skin thick.
a. Jaws moderate. Vomer dentigerous ....MURÆNESOCIDÆ
* Dorsal and anal well developed..*Murænesocinæ*
** Vertical fins scarcely developed except on tail ....[*Stilbiscinæ*.]
B. Pectorals moderate, weak, or absent.
1. End of tail more or less free.
a. Posterior nostrils in lip or near it; anterior one sometimes tubular ......OPHICHTHYIDÆ
* Fins present, at least on back ....*Ophichthyinæ*
** Fins absent...*Sphagebranchinæ*
2. Tip of tail more or less surrounded.
a. Dorsal well developed; pectorals sometimes united.... ....*Myrinæ*
Gill openings small, subinferior.
A. Pectorals lacking.
1. End of tail prolonged in a filament. Skin thin. Skeleton weak.
a. Jaws straight, slender, the upper longest.
* Teeth sharp, recurved. Vomer with a long series.....................NETTASTOMIDÆ
Gill openings convergent forward, separate or confluent.
A. Pectorals present (in American genera).
1. Jaws very long, recurved at tip..NEMICHTHYIDÆ

Family LEPTOCEPHALIDÆ.

Congeridæ, KAUP, Cat. Apodal Fish. in Brit. Mus., 1856, 108.
Congridæ, JORDAN & DAVIS, Rep. U. S. F. C., 1888 (1891), 658.
Leptocephalidæ, GILL, MS.

Body terete, moderately elongate, with the tip of the tail included between the connate vertical fins. Scales absent. Head large, with strong equal jaws. Tongue broad, its anterior portion comparatively free. Opercular and branchial bones well developed. Vomerine teeth moderate. Anterior nostril remote from eye. Posterior nostril, near the eye, tubeless, not touching the lip. Pectorals, well developed.

This family includes those eels which are scaleless and have the tongue largely free in front, the body moderately elongate, the end of the tail surrounded by a fin, the posterior nostril remote from the upper lip and near front of eye, and the pectoral fins well developed. All the species are plainly colored, grayish or dusky above, silvery below, and have the dorsal edged with black.

KEY TO THE GENERA OF LEPTOCEPHALIDÆ.

I. Vomerine teeth in bands, uniform in size; lips thick.
A. Dorsal origin behind root of pectoral.
1. Jaws with outer knife-like row of closely set teeth. Head with inconspicuous mucous cavities.
a. Tail considerably longer than body..........................[LEPTOCEPHALUS-CONGER]
B. Dorsal origin over the gill opening.
1. Jaws with bands of small teeth, the outer not forming a cutting edge. Bones of front of head with large muciferous cavities.
a. Tail one-half to two-thirds of total. Mouth rather small ....CONGERMURÆNA

II. Vomerine teeth uniserial, some of them canine-like; maxillary teeth biserial.
  A. Dorsal beginning above root of pectoral.
    1. Cleft of mouth extending beyond middle of eye.
      a. Tail very long and slender .... UROCONGER
III. Vomerine teeth absent.
  A. Tail very short.
    1. Teeth in a single unbroken row in each jaw .... COLOCONGER
  B. Tail as long as the trunk.
    1. Teeth, villiform in broad bands in the jaws and in a broad continuous patch on the palate. PROMYLLANTOR

UROCONGER, Kaup.

Uroconger, KAUP, Apodes, 110.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 43.—JORDAN & DAVIS, Rep. U. S. F. C., 1888 (1891), 658.

Anguilloid apodals with long, whip-like tail and without scales. Maxillary teeth biserial; vomerine teeth uniserial, some of them canine-like; dorsal fin inserted above the pectoral origin; mouth-cleft passing behind the middle of the orbit.

The unique species until 1888 was *Uroconger lepturus* (Richardson), Kaup, from the western and southern Pacific.

UROCONGER VICINUS, VAILLANT.

Uroconger vicinus, VAILLANT, Exp. Sci., Travailleur et Talisman, Poissons, 1888, 86, pl. VI, figs. 1, 1*a*, 1*b*.

A species distinguished from *U. lepturus* by a more compressed, higher body and tail, the thickness one-fiftieth, the height one-twentieth of total; by the presence of two strong teeth, one behind the other, on the anterior portions of the vomer, and by a space separating the gill openings which is considerably greater than the diameter of these openings.

U. vicinus, the sole representative of this genus in the Atlantic, was obtained by the French explorers from the Banc d'Arguin, 1,495 meters; off Soudan, 932 meters, and at the Cape Verde Islands, in 633 meters depth; three from the first locality, one from each of the others.

A young fish, provisionally placed in this species, was taken by the *Albatross* at station 2161, in 146 fathoms. (Figure 160.)

CONGERMURÆNA, Kaup.

Ophisoma, SWAINSON, Nat. Hist. Classn. Fish., II, 1839, 334 (in part).—JORDAN & DAVIS, Rep. U. S. F. C., 1888 (1891), 659.

Congermurœna, KAUP, Cat. Apodal Fishes, 1858, 108.

Congermrœna, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 200.

Gnathophis, KAUP, Aale Hamburg. Museum, 1859.

Anguilloid apodals characterized by a scaleless body, small mouth, large muciferous cavities in the anterior portions of the skull, teeth in jaws and on vomer small, those in the outer row not forming a cutting edge, arranged in bands, dorsal origin above the gill openings, mouth terminating below or in advance of the middle of the orbit. Lips thick. A long, whip-like tail.

Congermurœna occurs in the Mediterranean and on both sides of the middle Atlantic, and in the deep water of the Pacific. *C. guttulata*, Günther (Challenger Report, XXII, 252), was obtained by the *Challenger* off the Fijis in 315 fathoms. *C. longicauda*, Alcock was taken in the Andaman Sea, in 265 fathoms, and *C. prorigerum* (Gilbert) from off California, 401 fathoms.

CONGERMURÆNA FLAVA, GOODE and BEAN, n. s. (Figure 159.)

Lips somewhat thickened. Snout long, about twice diameter of eye, which is contained six times in length of head. Lower jaw projecting far beyond the upper. Anterior nostril in short tube, posterior nostril pore-like, in advance of eye, and above the horizontal line of its diameter. Cleft of mouth extending very slightly behind middle of eye. Teeth in very narrow bands, villiform, a dense cluster on the vomer. Length of head equal to that of the trunk. Tail about twice as long as body. Dorsal beginning far in advance of gill opening and pectoral. Color yellowish; blackish on termination of tail.

Specimens were obtained by the *Albatross* at stations 2121 and 2122, in 31 to 34 fathoms, and at station 2402, in 111 fathoms; also by the *Blake* at station CCLXIV, in 84 fathoms.

COLOCONGER, Alcock.

Colocongcr, ALCOCK, Ann. and Mag. Nat. Hist., Nov. and Dec., 1889, 456.

Snout and tail very short. Muscular and osseous systems well developed. Four gills, which communicate with the pharynx by wide slits. Gill openings separate. Heart situated immediately behind the gills. Eyes large. Posterior nostril superior. Cleft of mouth wide, extending beyond the middle of the eye. Tongue free. Teeth in a single continuous ridge in each jaw; none on the vomer. No scales. Vertical fins well developed, confluent; the dorsal begins above the root of the pectoral. Pectorals well developed.

This genus contains one species, *Coloconger raniceps*, Alcock (*loc. cit.*), taken by the *Investigator* in the Andaman Sea, off Ross Island, in from 265 to 271 fathoms.

PROMYLLANTOR, Alcock.

Promyllantor, ALCOCK, Ann. & Mag. Nat. Hist., sixth series, Vol. 6, p. 310.

A genus allied to *Congromuræna*, with body stout, with the muscular and osseous systems well developed. Tail about as long as the trunk. Muciferous cavities of the head well developed. Eye rather small. Cleft of the mouth narrow, not extending behind the middle of the eye. Villiform teeth in broad bands in the jaws and in a broad, confluent patch on the palate. Tongue free. Nostrils lateral. Gill openings widely separate; four gills with wide clefts. No scales. Pectoral and vertical fins well developed, the latter confluent. The dorsal begins some distance behind the occiput.

The genus is known from one species, *P. purpureus*, Alcock, from 1,000 fathoms in the Arabian Sea, by the *Investigator* at station 104.

Family SIMENCHELYIDÆ.

Simenchelyidæ, GILL (with GOODE and BEAN), Bull. Essex Inst., v, 11, 27, 1879; Standard Nat. Hist., III, 107, 1885; Proc. U. S. Nat. Mus., XIII, 1890, 239 (No. 817).—JORDAN, Rep. Com. Fish., 1885, v, 13, 844 (Sep., p. 56, 1885), 1887.—JORDAN and DAVIS, Rep. U. S. F. C., 1888 (1891), 669.
Simenchelyinæ, JORDAN and GILBERT, Syn. Fishes N. Am., 357, 1882.

Apodal fishes with snout blunt; anterior, transverse mouth; jaws massive and teeth blunt, uniserial, on edge of jaws only; no teeth on vomer, gill openings horizontal, inferior, moderately separated.

SIMENCHELYS, Gill.

Simenchelys, GILL (with GOODE and BEAN), Bull. Essex Inst., XI, 1880, p. 27.
Conchognathus, COLLETT, Bull. Soc. Zool. France, 1889, 122.

Body eel-like, with a short, blunt snout and an eel-like tail. The branchial apertures are short logitudinal slits on each side of the throat below the pectorals, which are well developed; the dorsal commences about a head's length behind the pectorals, the anal considerably in advance of the second half of the total length. The skin has scales like those of *Anguilla*, linear, scattered, and disposed at right angles to each other. The head is very short; the premaxillaries and maxillaries of each side consolidated into a single piece and separated from that of the opposite side by the ethmoid, and provided with lamelliform posterior margin and an expanded antero-terminal process; mandible very deep; teeth blunt, uniserial; the operculum saber-shaped.

SIMENCHELYS PARASITICUS, GILL. (Figure 161.)

Simenchelys parasiticus, GILL (with GOODE and BEAN), Fish. Essex Co. & Mass. Bay, 1879, 27.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 363.—GÜNTHER, Challenger Report, XXII, 252.—GILL, *loc. cit.*—JORDAN & DAVIS, *loc. cit.*—*Conchognathus Grimaldii*, COLLETT, Bull. Zool. Soc. France, 1889, 122.

Head blunt, rounded, bulldog-like in aspect; angle of mouth midway between the tip

Head blunt, rounded, bulldog-like in aspect; angle of mouth midway between the tip of snout and anterior edge of eye. Body stout, its depth at origin of dorsal about equal to length of head. Dorsal origin a head's length behind gill openings; diameter of eye half the length of the snout or a little more; length of pectoral two-fifths that of head; length of body ten or eleven times that of the head; tail a head's length longer than head and trunk. Color brown, uniform.

This very remarkable form was first known from a few specimens brought to Gloucester in 1879 by the fishing vessels. It burrows in the muscles of living halibut and other large fishes, after the manner of *Myxine*, and excavates large cavities in the thickest parts of their bodies. These first examples were from depths of 200 to 300 fathoms. Subsequently the *Albatross* obtained it from various bottom localities at depths of from 200 to 904 fathoms.

This fish has occasionally been found embedded in the flesh of larger fishes, but has also been obtained in the trawl net by the *Albatross* at the following stations:

No. 35662, U. S. N. M., was from station 2238, in 39° 06′ N. lat., 72° 10′ W. lon., in 904 fathoms; No. 35558, U. S. N. M., from station 2204, in 39° 30′ 30″ N. lat., 71° 44′ 30″ W. lon., at a depth of 728 fathoms; and from station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms, and station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms. Also by the *Fish Hawk*, as follows: No. 29070, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; No. 26172, U. S. N. M., from station 892, in 39° 46′ N. lat., 71° 05′ W. lon., at a depth of 487 fathoms; and No. 28758, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms. Also by the Gloucester fishing fleet, as follows: No. 21669, U. S. N. M. (179), Banquereau; No. 21673, U. S. N. M. (226), near Sable Island Bank; No. 22791, U. S. N. M. (234), in lat. 42° 47′ N., lon. 63° 10′ W., at a depth of 375 fathoms; No. 24207, U. S. N. M. (353), in lat. 44° 28′ N., lon. 56° 24′ W., at a depth of 200 fathoms; No. 24724, U. S. N. M. (446), in lat. 42° 33′ N., lon. 64° 20′ W., at a depth of 300 fathoms; No. 24267, U. S. N. M. (513), in lat. 42° 46′ N., lon. 65° 18′ W., at a depth of 200 fathoms; No. 24264, U. S. N. M. (519), in lat. 43° 48′ N., lon. 59° 00′ W., at a depth of 250 fathoms; No. 24266, U. S. N. M. (542), Banquereau, at a depth of 200 fathoms; No. 24413, U. S. N. M. (484), in lat. 43° 42′ N., lon. 59° 10′ W., at a depth of 300 fathoms; No. 24265, U. S. N. M. (526), in lat. 43° 52′ N., lon. 59° 09′ W., at a depth of 200 fathoms.

In 1889 numerous examples of an anguilliform fish were taken in nets at the Azores Islands at depths varying from 844 to 2,000 meters by the yacht *Hirondelle*, under the auspices of the Prince of Monaco. These were subsequently determined to belong to a peculiar form called by Dr. Robert Collett *Conchognathus Grimaldii*. A comparison of the description given indicates plainly that the supposed new generic type is identical with *Simenchelys*. It has the same scaly skin, short, truncated head, small mouth, acrodont teeth, inferior branchial slits, and large "conchiform" lower jaw, reference to which is conveyed in the generic name.

The question naturally arises, says Gill, whether the *Simenchelys parasiticus* and *Conchognathus Grimaldii* are distinct. So far as can be judged from the description of Dr. Collett this question must be answered in the negative. The measurements of two specimens of nearly the same size correspond closely enough for specific purposes, except as to height. That measurement for the *Conchognathus Grimaldii* has evidently been obtained from a specimen with a very full belly,* and not at the pectoral or anal region. The measurements from an American specimen are subjoined for comparison with measurement of an Azorean one given by Dr. Collett:

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* Le corps est comprimé; le museau est tronqué; le ventre un peu pendant, très dilatable.—Collett, *op. cit.*, p. 124.

	American.	Azores.
	Mm.	*Mm.*
Total length	419	417
Snout to branchial slit	34	37
Snout to dorsal	64	67
Snout to anus	184	180
Height of trunk:		
At pectoral	30	....
At belly	33	40
At anus	23	....
Width of mouth	11	11
Diameter of eyeball	6	6
Length of pectoral	18	15
Numbers.		
Teeth	[illegible]	28
Branchiostegals	8-9	8
Pectoral rays	15	14

Family ILYOPHIDÆ, Gilbert.

Ilyophididæ, GILBERT, in JORDAN and DAVIS, Rept. U. S. F. C., 1888 (1891), 670.

Apodal fishes, with a conical and slender snout, moderately strong jaws, with sharp teeth in bands; teeth in a band upon the vomer. Gape lateral. Gill openings separate, horizontal, inferior. Branchiostegal rays long, curved, as in *Simenchelyidæ*. Lips obsolete. Tongue obsolescent. Scales present, minute. General aspect similar to that of *Synaphobranchidæ*.

The family is at present composed of a single genus.

ILYOPHIS, Gilbert.

Ilyophis, GILBERT, *loc. cit.*

Body scaly; pectorals well developed; lateral line prominent; gill slits horizontal, inferior, well separated; nostrils lateral, the posterior immediately in front of the eye; the anterior with a short tube, near tip of snout. Maxillaries as in *Synaphobranchus*; the clamping processes closely appressed to the side of the vomer behind its head; lower jaw strong, apparently with the coronoid process well developed; series of teeth on head and shaft of vomer continuous; no lips; tongue little developed, with narrow free margin; branchiostegal rays 15 in number (as determined without dissection), not shortened, some of them curved around and above the opercle. Dorsal, anal, and caudal confluent, rather high, the rays clearly visible through the skin; dorsal beginning well forward, its origin immediately behind the base of pectorals; origin of anal near end of anterior third of body. (*Gilbert.*)

It is represented by a single species, *Ilyophis brunneus*, Gilbert (fig. 162), obtained by the *Albatross* off the Galapagos*.

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* *Ilyophis brunneus*, GILBERT, *loc. cit.*

Body narrow, compressed throughout; snout and jaws slender; gape one-half length of head, extending beyond the eye for a distance less than the diameter of the latter; maxillary teeth small, bluntly conic, in narrow band; teeth on vomer large, conic, those on shaft of vomer in single row; teeth in mandible in narrow band, those on the inner series enlarged and retrorse though less than half the size of the vomerine teeth; front of pupil over end of second third of length of jaw; gill slits narrow, inferior, horizontal, crescent-shaped, about equaling horizontal diameter of eye, their lower (anterior) ends separated by a distance equal to their own length, their upper (posterior) ends by 1½ times that distance; head 2 in trunk; head and trunk 3½ in total length; pectorals small, 6 in head, rays evident; scales very fine, arranged in groups at right angles to one another; lateral line running high anteriorly, its pores white and conspicuous. Color brown, the fins, lower side of head, and branchial regions darker. (*Gilbert.*)

Family SYNAPHOBRANCHIDÆ.

Synaphobranchidæ, Johnson, Proc. Zoöl. Soc. London, 1862, 169.—Gill, Arrangement Fam. Fishes, 1872, 20; Standard Nat. Hist., III, 1885, 108.—Jordan and Gilbert, Bull. XVI, U. S. N. M., 1882, 364.—Jordan and Davis, *loc. cit.*, 671.

Synaphobranchoidei, Bleeker, Atlas Ich. Indo-Neerland., IV, 1864, 13.

Synaphobranchina, Günther, Cat. Fishes B. M., 1870, VIII, 19, 22.

Apodal fishes with body slender, anguilliform, moderately compressed anteriorly, much compressed toward end of tail, and with the anus in the anterior third of the total length.

Scales small, linear or elongate elliptical, arranged in small groups obliquely at right angles to those of the neighboring groups. Lateral line distinct, more or less high up and on each side of the back in front, but gradually declining, and near the middle behind.

Head moderate, compressed, oblong, conic laterally, with all the bones invested in the skin. Eyes within the anterior half of the head, directed sideways, of moderate or large size, covered by thin skin. Nostrils lateral, the posterior considerably in advance of the lower half of the eye, the anterior near the tip of the snout and subtubular. Mouth with the cleft slightly oblique, extending considerably beyond the eyes. Jaws well developed; maxillines approximated close to the front of the vomer, with the clamping processes selliform and appressed closely to the sides of the vomer behind its head, with ledge-like extensions within along the anterior half, and expanding vertically backwards; mandible slender, the dentary with the coronoid process obsolete, the surface of the bone having a corneous appearance behind, ensheathing the articular, which extends well forward in front of the condyle and scarcely at all backwards. Teeth conic, in a narrow band in the jaws and vomer. Lips obsolete. Tongue little developed. Periorbital bones almost membranous.

Opercular apparatus feebly developed; operculum lamelliform and claviform, inserted very low on the hyomandibular; suboperculum expanding downwards and with an anterior process continued in front of the operculum; interoperculum lamelliform, intervening between the suboperculum and preoperculum; preoperculum almost reduced to a muciferous canal.

Branchial apertures inferior and confluent in a single external, longitudinal slit. Branchiostegal rays in moderate number (about 15), attached to the sides of the compressed ceratohyal and epihyal, slender, abbreviated, and moderately bowed, not being curved up above the operculum.

Dorsal, anal, and caudal confluent in an uninterrupted fin, with the rays readily perceptible through the skin; dorsal variable, commencing behind or in front of the anus and mostly low, anal deeper and commencing close behind the anus; caudal prominent.

Pectorals well developed, near the breast, with the rays distinct.

Branchial arches nearly complete, with slender glossohyal and urohyal, and with the first, second, and third basibranchials ossified, first and second hypobranchials ossified, third cartilaginous, ceratobranchials and epibranchials of four pairs, ossified; pharyngobranchials of second pair rod-like, of third pair developed as dentigerous epipharyngeals; hypopharyngeals oblong, closely apposed to and superincumbent on the rudimentary fifth arch. Interbranchial fissures extended. (*Gill.*)

KEY TO THE GENERA OF SYNAPHOBRANCHIDÆ.

I. Origin of dorsal behind vent; pectoral longer than snout; snout slender; teeth in a single patch on vomer .... SYNAPHOBRANCHUS

II. Origin of dorsal near head; pectoral not longer than snout; snout stout; teeth in two patches on vomer .... HISTIOBRANCHUS

SYNAPHOBRANCHUS, Johnson.

Synaphobranchus, Johnson, Proc. Zoöl. Soc., London, 1862, 169.—Günther, Cat. Fish. Brit. Mus., VIII, 19.—Gill, Standard Natural History, III, 108; Proc. U. S. Nat. Mus., XIII, 161.—Jordan & Davis, *loc. cit.*

Origin of dorsal fin far back, remote from the head and behind the vent and origin of dorsal. Anterior nasal tubes prominent. Snout slender. Pectoral longer than snout. Teeth on the vomer in a single patch.

SYNAPHOBRANCHUS PINNATUS, (GRONOVIUS), GÜNTHER. (Figure 164.)

Muræna pinnata, GRONOVIUS, Syst. Ichth. (ed. Gray), 19.
Synaphobranchus pinnatus, GÜNTHER, Cat. Fish. Brit. Mus., 1870, VIII, 23; Challenger Report, XXII, 253, pl. LXII, fig. A.—GOODE and BEAN, Bull. Essex Inst. 1879, XI, 26; Bull. Mus. Comp. Zoöl., 1883, X, 223.—VAILLANT, Exp. Sci. Travailleur et Talisman, Poiss., 88, pl. VI, figs. 2, 2a, 2b, 2c.
Synaphobranchus Kaupii, JOHNSON, Proc. Zoöl. Soc., 1862, 169.
Synaphobranchus affinis, GÜNTHER, Ann. and Mag. Nat. Hist., 1877, XX, 445.

Jaws subequal in length, sometimes the lower, sometimes the upper the longer; the upper with a projecting fleshy tip; maxillary reaching to opposite gill openings, which are rather longer than the large eye. Head 3⅛ in distance from snout to dorsal, 2¾ in distance to anal, 8⅜ in length. Vomerine teeth uniserial. Eye broader than interorbital space, rather nearer tip of snout than end of maxillary. Tail about twice as long as body. Pectoral slender, longer than snout. Uniform brown, rather darker below; the vertical fins darker behind, light-edged anteriorly; inside of mouth blue-black; gill openings dark.

This remarkable eel was first made known by the Madeiran ichthyologists, Lowe and Johnson, by whom it was found at 740 fathoms and in intermediate depths. The *Challenger* obtained it near the coast of Brazil, in 1,200 fathoms; off Japan, in 345 to 565 fathoms; and about the Philippines, in 375 to 500 fathoms. Its presence in the western Atlantic was first detected by the Cape Ann fishermen, who in 1879 began bringing them in from the offshore banks, where they had been taken on trawl lines at 200 to 300 fathoms. In 1879 the *Fish Hawk* took it often in 250 to 365 fathoms, and subsequently the *Albatross* and the *Blake* brought it in from numerous stations at depths of 300 to 1,000 fathoms. The *Travailleur* and *Talisman* took it in numerous localities; off Morocco, 912–2,210 meters; off the Canaries, 865–2,083 meters; off Soudan, 882–1,435 meters; on the Banc d'Arguin, 1,113–1,550; off the Cape Verdes, 405–3,200; off the Azores, 1,257–2,235 meters.

Specimens of this species were obtained by the *Blake* from the following localities: Station CCCIX, in 38° 18′ 40″ N. lat., 73° 18′ 10″ W. lon., at a depth of 304 fathoms; Station CCCIII, in 41° 34′ 30″ N. lat., 65° 54′ 30″ W. lon., at a depth of 306 fathoms; Station CCCXII, in 39° 50′ 45″ N. lat., 70° 11′ W. lon., at a depth of 466 fathoms; Station CCCXXV, in 33° 35′ 20″ N. lat., 76° W. lon., at a depth of 647 fathoms; Station CCCXXXVII, in 38° 20′ 08″ N. lat., 73° 23′ 20″ W. lon., at a depth of 740 fathoms; Station CCCXXVI, 33° 42′ 15″ N. lat., 76° 50″ W. lon., at a depth of 464 fathoms; Station CCCXXIX, in 34° 39′ 40″ N. lat., 75° 14′ 40″ W. lon., at a depth of 603 fathoms; also five specimens, locality unknown.

Specimens were also secured by the *Fish Hawk* from station 881, in 39° 46′ 30″ N. lat., 70° 54′ W. lon., at a depth of 325 fathoms; Cat. No. 26108, U. S. N. M., from station 880, in 39° 48′ 30″ N. lat., 70° 54′ W. lon., at a depth of 252½ fathoms; Cat. No. 28746, U. S. N. M., from station 925 in 39° 55′ N. lat., 70° 47′ W. lon., at a depth of 224 fathoms; Cat. No. 26736, U. S. N. M., from station 898, in 37° 24′ N. lat., 74° 17′ W. lon., at a depth of 300 fathoms; Cat. No. 28796, U. S. N. M., from station 947, in 39° 53′ 30″ N. lat., 71° 13′ 30″ W. lon., at a depth of 319 fathoms; Cat. No. 28759, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; Cat. No. 29072, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22 W. lon., at a depth of 435 fathoms; Cat. No. 28944, U. S. N. M., from station 1030, in 39° 58′ 30″ N. lat., 69° 15′ W. lon., at a depth of 337 fathoms; Cat. No. 31777, U. S. N. M., from station 1142, in 39° 32′ N. lat., 72° W. lon., at a depth of 322 fathoms; Cat. No. 31769, U. S. N. M., from station 1143, in 39° 29′ N. lat., 72° 01′ W. lon., at a depth of 452 fathoms; Cat. No. 28895, U. S. N. M., from station 997, in 39° 42′ N. lat., 71° 32′ W. lon., at a depth of 335 fathoms; Cat. No. 28914, U. S. N. M., from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; Cat. No. 28944, U. S. N. M., from station 1030, in 39° 58′ 30″ N. lat., 69° 15′ W. lon., at a depth of 337 fathoms; Cat. No. 26737, U. S. N. M., from station 898, in 37° 24′ N. lat., 74° 17′ W. lon., at a depth of 300 fathoms; Cat. No. 28930, U. S. N. M., from station 1028, in 39° 57′ N. lat., 69° 17′ W. lon., at a depth of 410 fathoms; Cat. No. 31598, U. S. N. M., from station 1093, in 39° 56′ N. lat., 69° 45′ W. lon., in 349 fathoms; Cat. No. 31776, U. S. N. M., from station 1138, in 39° 39′ N. lat., 71° 54′ W. lon., at a depth of 168 fathoms; Cat. No. 28940, U. S. N.

M., from station 1029, in 39° 57′ 06″ N. lat., 69° 16′ W. lon., at a depth of 458 fathoms; Cat. No. 28844, U. S. N. M., from station 951, in 39° 57′ N. lat., 70° 31′ 30″ W. lon., at a depth of 225 fathoms; and Cat. No. 28757, U. S. N. M., from station 938, in 39° 51′ N. lat., 69° 49′ 15″ W. lon., at a depth of 310 fathoms.

Specimens were taken by the *Albatross* from station 2075, in 41° 40′ 30″ N. lat., 65° 35′ W. lon., at a depth of 855 fathoms; from station 2115, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., at a depth of 843 fathoms; Cat. No. 35419, U. S. N. M., from station 2181, in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms; from station 2415, in 30° 44′ N. lat., 79° 26′ W. lon., at a depth of 440 fathoms; from station 2385, in 28° 51′ N. lat., 88° 18′ W. lon., at a depth of 730 fathoms; from station 2116, in 35° 45′ 23″ N. lat., 74° 31′ 25″ W. lon., at a depth of 888 fathoms; from station 2529, in 41° 03′ 30″ N. lat., 66° 14′ W. lon., at a depth of 662 fathoms; from station 2530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; from station 2533, in 40° 16′ 30″ N. lat., 67° 26′ 15″ W. lon., at a depth of 828 fathoms; from station 2534, in 40° 01′ N. lat., 67° 29′ 15″ W. lon., at a depth of 1,234 fathoms; from station 2535, in 40° 03′ 30″ N. lat., 67° 27′ 15″ W. lon., at a depth of 1,149 fathoms; from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; Cat. No. 33565, U. S. N. M., from station 2096, in 39° 22′ 20″ N. lat., 70° 52′ 20″ W. lon., at a depth of 1,451 fathoms; Cat. No. 35315, U. S. N. M., from station 2201, in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms; Cat. No. 35535, U. S. N. M., from station 2204, in 39° 30′ 30″ N. lat., 71° 44′ 30″ W. lon., at a depth of 728 fathoms; Cat. No. 33374, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 25426, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; Cat. No. 33371, U. S. N. M., from station 2078, in 41° 11′ 30″ N. lat., 66° 12′ 20″ W. lon., at a depth of 499 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms; from station 2561, in 39° 38′ N. lat., 71° 42′ W. lon., at a depth of 500 fathoms; from station 2548, in 39° 56′ N. lat., 70° 14′ 30″ W. lon., at a depth of 200 fathoms; from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., at a depth of 571 fathoms; from station 2561, in 39° 38′ N. lat., 71° 42′ W. lon., at a depth of 500 fathoms; from station 2547, in 39° 54′ 30″ N. lat., 70° 20′ W. lon., at a depth of 390 fathoms; from station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; from station 2078, in 41° 11′ 30″ N. lat., 66° 12′ 20″ W. lon., at a depth of 499 fathoms; Cat. No. 33298, U. S. N. M., from station 2046, in 40° 02′ 39″ N. lat., 68° 49′ W. lon., at a depth of 407 fathoms; from station 2025, in 40° 02′ N. lat., 70° 27′ W. lon., at a depth of 239 fathoms; from station 2083, in 40° 26′ 20″ N. lat., 67° 05′ 15″ W. lon., at a depth of 959 fathoms; Cat. No. 35481, U. S. N. M., from station 2186, in 39° 52′ 15″ N. lat., 70° 55′ 30″ W. lon., at a depth of 353 fathoms; from station 2110, in 35° 12′ 10″ N. lat., 74° 57′ 15″ W. lon., at a depth of 516 fathoms; from station 2395, in 28° 36′ 15″ N. lat., 86° 50′ W. lon., at a depth of 347 fathoms; Cat. No. 35485, U. S. N. M., from station 2196, in 39° 35′ N. lat., 69° 44′ W. lon., at a depth of 1,230 fathoms; Cat. No. 35488, U. S. N. M., from station 2189, in 39° 49′ 30″ N. lat., 70° 26′ W. lon., at a depth of 600 fathoms; Cat. No. 33472, U. S. N. M., from station 2083, in 40° 26′ 40″ N. lat., 67° 05′ 15″ W. lon., at a depth of 959 fathoms; Cat. No. 35471, U. S. N. M., from station 2185, in 40° 45″ N. lat., 70° 54′ 15″ W. lon., at a depth of 129 fathoms; Cat. No. 35447, U. S. N. M., from station 2194, in 39° 43′ 45″ N. lat., 70° 07′ W. lon., at a depth of 1,140 fathoms; and Cat. No. 35524, U. S. N. M., from station 2201, in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms.

S. brevidorsalis, from the Pacific Ocean, north of New Guinea, 1,070 fathoms, and off Japan, 345 fathoms (Günther, Challenger Report, XXII, 255, pl. LXIII, fig. c), resembles *S. pinnatus* in general structure; but its dorsal fin begins far behind the vent, rather than above it, as in the other species.

The species described by Dr. Günther as *S. affinis* is now considered by him to be identical with the Atlantic form. It was taken by the *Challenger*, station 232, off Inosima, Japan, 345 fathoms.

HISTIOBRANCHUS, Gill.

Histiobranchus, Gill, Proc. U. S. Nat. Mus., 1883; vi, 255, 1890, xiii, 161.—Jordan and Davis, loc. cit., 672.

Synaphobranchids with origin of dorsal almost as far forward as the base of the pectoral and far in advance of the anal. Vent nearly in the middle of the length of the body. Vomerine teeth in two patches, that in front being the larger. (*Gill.*)

HISTIOBRANCHUS INFERNALIS, Gill. (Figure 165.)

Histiobranchus infernalis, Gill, *loc. cit.*
Synaphobranchus infernalis, Günther, Challenger Report, xxii, 254.

Body moderately elongated and compressed; its height at the anus equals .56 of the length and the greatest width above the stomach being less than two thirds of the height. The head forms about one-ninth of the total length, and its width is a little less than one-half its length; the snout is moderate, the length being less than the greatest width of the head. The eye is also moderate, its diameter being much less than one-half the length of the snout.

The upper jaw is nearly one-tenth of the total length and the lower jaw a little more.

The dorsal commences not far behind the vertical from the root of the pectoral, while the anal arises little nearer the snout than the end of the tail; both are moderately developed.

The pectorals are considerably shorter than the snout.

The color in life is said to be an almost uniform dark plumbeous, but in alcohol the trunk is dark yellowish brown, becoming almost black on the abdominal region and around the pectoral as well as on the intermandibular integuments and around the pectorals, while the dorsal and anal are whitish except towards the posterior fourth of the length, where they are very dark or blackish.

A specimen, No. 33279, was taken by the *Albatross* at station 2037, lat. 38° 30′ 30″ N., lon. 69° 08′ 25″, W., in 1,731 fathoms.

Another species of the same genus, characterized mainly by stouter body and lower vertical fins, is *Histiobranchus bathybius*, Günther (*Synaphobranchus bathybius*, Günther, Ann. and Mag. Nat. Hist., xx, 1877, 445, Challenger Report, xxii, 254, pl. lxii, fig. B), a stouter, chunkier form, with shorter snout and tail, and smaller fins, obtained in the Pacific and Indian oceans, at depths from 1,375 to 2,050 fathoms.

Family MURÆNESOCIDÆ.

Congriformes Murænesoces, Bleeker, Atl. Ichth. Ind. neerl., i, 1864, 19.
Murænesocina, Günther, Cat. Fish. Brit. Mus., viii, 1870, 20
Murænesocinæ, Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 1882, 387.
Murænesocidæ Cope, Proc. Am. Ass. Adv. Sci., 1871 (1872), 334.—Gill, Arr. Fam. Fish. 1870, 20; Proc. U. S. Nat. Mus., 1890, 321.—Jordan and Davis, Rep. U. S. F. C., 1888 (1891), 643.

Anguilloid apodals, with thick skeleton, thin scaleless skin, and tail surrounded by vertical fins; pectoral well developed; jaws of moderate length; vomer well armed; posterior nostril not lateral; tongue narrow, its margins adnate; gill openings rather wide. "Branchiostegal membrane connecting the opposite sides below, the epipharyngeals reduced to one pair, and the hypopharyngeals linguiform and encroaching on the fourth branchial arch."

"The characters which appear to distinguish the *Murænesoces* best from the Anguillids and Congrids or Leptocephalids are the low position on the hyomandibular of the condyle for the operculum, the slender branchial arches and the development and position of the hypopharyngeals and epipharyngeals, the union of the opposite branchiostegals by the inferior branchiostegal membrane, and the want of freedom of the tongue. Whether the other genera that have been closely associated with *Murænesox* (*Hoplunnis*, *Oxyconger*, *Neoconger*, *Nettastoma*, and *Saurenchelys*) are related to the family can only be determined by an examination of their skeletons. The species combined under the name *Murænesox* are the only ones known to be certainly possessed of the characters provisionally assigned to the family." (*Gill.*)

This family may provisionally receive, in addition to its typical form, a number of genera, chiefly American. They occur chiefly in warm regions. Only three genera are as yet known from the deeper waters, *Xenomystax*, *Hoplunnis*, and *Sauromurænesox.*

XENOMYSTAX, Gilbert.

Xenomystax, GILBERT, with JORDAN & DAVIS, Rep. U. S. F. C., 1888 (1891), 648.

Teeth all conical, slender, and sharp, those of jaws in wide bands; maxillary with deep groove, running the entire length of the bone and dividing the band of teeth into two portions; shaft of vomer with a medial series of conical teeth.

The genus is represented by a single species, *X. atrarius*, Gilbert (*loc. cit.*), from 401 fathoms off the west coast of Ecuador.

HOPLUNNIS, Kaup.

Hoplunnis, KAUP, Aale Hamburg. Museum, 1859, 19 (type *H. Schmidtii*).—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 49.—JORDAN & DAVIS, loc. cit., 643.

Murænesocids, with scaleless body, with tail about four times as long as trunk. Snout moderately produced. Teeth eight, biserial and small on jaws. Vomerines with a single series of long-pointed teeth. Dorsal and anal well developed, the origin of the former above the gill opening. Gill opening small. Posterior nostril in front of eyes.

HOPLUNNIS DIOMEDIANUS, GOODE and BEAN, n. s. (Figure 163.)

A *Hoplunnis* related to *H. Schmidti*, with height of body one-quarter length of head; its width two-thirds of its height. Snout three to three and two-thirds times eye. Cleft of mouth extends slightly beyond hind margin of eye. Teeth in jaws small, pointed, in narrow bands, the inner series of the lower jaw consisting of enlarged, widely separated canines. A pair of larger canines near the end of the lower jaw in the example figured. A row of six to eight strong, large canines on the vomer.

A single individual (No. 44240 U. S. Nat. Mus.) was obtained by the *Albatross* at station 2402, 111 fathoms, lat. 28° 36′, long. 86° 50′.

SAUROMURÆNESOX, Alcock.

Sauromurænesox, ALCOCK, Ann. and Mag. Nat. Hist., Nov. and Dec., 1889, 457.

Form of the body widely departing from the typical, the trunk being high and well marked off from the head and tail, which is a long, tapering appendage. Tissues well developed. Gills four, opening into the pharynx by wide slits; gill openings separate. Heart situated immediately behind the gills. Nostrils lateral. Eye large. Tongue free. Vertical fins ill developed, confluent; the dorsal begins in front of the level of the gill opening. Pectoral fins well developed. No scales. Snout long, pointed. Cleft of mouth extending far behind the eye; the upper jaw overlapping the lower. One complete row of teeth in each jaw and a second incomplete row in the maxilla; premaxillary teeth and those at the mandibularly symphysis fang-like; a single row of large fangs in the vomer.

This genus is represented by one species, *S. vorax*, Alcock, from Bay of Bengal, taken at the depth of 193 fathoms.

Family OPHICHTHYIDÆ.

Ophichthyidæ, GILL, Standard Natural History, III, 1885, 107.
Ophisuridæ, KAUP, Cat. Apod., 1856, I.—JORDAN & DAVIS, Rep. U. S. F. C., 1888 (1891), 612.

Ophichthyoid, apodal fishes, with gill openings rather wide, lateral; scaleless body, and tip of tail sometimes free from vertical fins (sometimes with filamentous caudal fin). Pectorals moderate, weak, or absent. Posterior nostrils in lip or near it; anterior nostrils sometimes tubular.

This family includes a large number of genera, of which seventeen are recognized by Jordan and Davis in their paper on the Apodal Fishes of America and Europe. Gill groups them in three subfamilies, as shown in the key already presented.

These apodals are found chiefly in warm seas. Only one genus of the typical Ophisuroids, *Pisoodonophis*, is found at any distance below the surface.

PISOODONOPHIS, Kaup.

Pisoodonophis, KAUP, Cat. Apodal Fish. Brit. Mus., 1856, 15.—JORDAN and DAVIS, Rep. U. S. F. C., 1888 (1891), 619.
Pisodontophis, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 55.

Ophichthyoid apodals, with tip of tail free. Dorsal and anal fins well developed, the former low, beginning far back. Teeth blunt, granular; vomer with teeth. Pectoral fins present, small.

Of this genus, closely allied to *Myrichthys*, a single species has been found at considerable depths in the western Atlantic. Four species from Indian seas are mentioned in Günther's "Catalogue," and he refers to a half grown individual obtained from Grenada, in the West Indies, which seemed to him identical with *P. boro*, the type of the genus. *P. cruentifer*, described by us below, is perhaps most closely allied to *P. cancrivorus* (Richardson), known from the East Indian Archipelago and Australia.

PISOODONOPHIS CRUENTIFER, GOODE and BEAN, N. S. (Figure 166.)

Length of the head equal to one fourth of the distance from the gill opening to the vent, and the length of the body about two-thirds that of the tail. The cleft of the mouth is rather wide, measuring one-third of the length of the head, counting from the end of the upper jaw. The snout is conical, depressed. The head is snake-like in appearance, with powerful muscular enlargements of the cheeks and a constriction behind the head somewhat like that of *Derichthys*. Eye moderate, its length half that of the snout, and one-tenth that of the head. Teeth granular, in conspicuous bands, a small oblong patch on the premaxillaries and a long band upon the vomer. The length of the pectoral fin is about two-sevenths that of the head. It is broad, spatulate. The dorsal begins far behind the tip of the pectoral, its distance from the tip of the snout being one-seventh of the total length, or from gill opening to dorsal origin two-thirds length of head. Dorsal and anal fins of moderate height.

Color uniform brownish yellow.

This species has been found in the following localities: Types, two specimens, No. 28938, station 1035 of the U. S. Fish Commission steamer *Fish Hawk*, were taken in N. lat. 39° 57′, W. lon. 69° 28′, in 120 fathoms. Another specimen was taken by the same steamer in about the same locality, No. 30233, and three others, No. 31711, in N. lat. 39° 56′, W. lon. 70° 35′, in a depth of 245 fathoms. The types of the description are 16⅝ and 14¼ inches long.

The peculiar and savage physiognomy of this fish suggests at once the idea that it is a parasitic boring form, and in confirmation of this we have specimens taken by the fishermen on Jeffrey's Bank and also another from New Bedford, taken by Mr. J. H. Thompson from the body of a fish. We have occasionally taken the dried and shriveled remains of a fish apparently closely related to this from salted halibut and codfish.

MYRUS, Kaup.

Myrus, KAUP, Cat. Apod., 1856, 31.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 49.
Echelus, RAFINESQUE, Caratteri, etc., 1810, 64 (in part).—BLEEKER, Atlas Ichth. Murènes, 1864, 30.—JORDAN & DAVIS, Rep. U. S. F. C. 1888 (1891), 64.

Body elongate, subterete, with tail longer than rest of body. Dorsal origin well forward, close behind base of pectoral. Nostrils on, or very close to, the margin of the upper lip; the anterior tubular, the posterior lobed. Vertical and pectoral fins well developed; caudal rays very short. Teeth in jaws on cardiform bands subequal in size. Vomer dentigerous.

MYRUS PACHYRHYNCHUS (VAILLANT) JORDAN and DAVIS. (Figure 167.)

Myrus pachyrhynchus (VAILLANT), Exp. Scient. Travailleur et Talisman, 1888, 11, pl. v, figs. 1, 1a, 1b.
Echelus pachyrhynchus, JORDAN and DAVIS, *loc. cit.*

A *Myrus* with a short, thick snout, elongate body, and with a comparatively elongate pectoral (its length 2⅜ in that of head). Origin of dorsal behind tip of pectoral. Length of tail three-fifths of total length. Height and thickness of body 33 in total length. Length of snout one-third of total length of the head; diameter of eye and of interorbital space equal to one-fifth of same. Lateral line distinct. Color gray; fins paler. Gill openings black.

Myrus pachyrhynchus is the abyssal representative, not very remote in its affinities, of *Myrus myrus* (L.), a well-known Mediterranean form and *M. uropterus* (Schlegel) from Japan. It has been found off the Morocco coast, 1,050 to 1,435 meters, and also at the Cape Verdes in 460 fathoms.

Family NETTASTOMIDÆ.

Nettastomidæ, JORDAN and DAVIS, Rep. U. S. F. C., 1888 (1891), 649.

This family, as understood by us, contains a few species of deep-sea eels closely allied to the *Murænesocidæ* in technical characters, but more resembling the *Nemichthyidæ* in appearance, form of the head, and in dentition. The family, which is a provisional one, may be thus defined.

Enchelycephalous eels without pectoral fins, with the tongue not free, the posterior nostrils remote from the lip, the gill openings small, separate, and subinferior, the vent remote from the head, the tail ending in a slender tip or filament, the dorsal and anal fins moderately developed, and the jaws produced, slender, and straight, the upper the longer, and both, as also the vomer, armed with bands of sharp, close-set, recurved, subequal teeth.

Three genera are known, deep-sea fishes with fragile bodies and the thin skin charged with black pigment. (*Jordan and Davis.*)

KEY TO THE GENERA OF NETTASTOMIDÆ.

[After JORDAN and DAVIS.]

I. Dorsal fin low, beginning nearly above gill opening.
  A. Nostrils nearly superior, the posterior above and in front of eye, the anterior at tip of bony portion of snout; head with numerous mucous pores.
    1. Snout without a fleshy proboscis, the anterior nostrils near its tip.................... NETTASTOMA
    2. Snout, with a long, slender, fleshy tip or proboscis, at the base of which are the anterior nostrils VENEFICA.
  B. Nostrils lateral, the posterior slit-like and placed just in front of eye; snout without fleshy tip. CHLOPSIS

NETTASTOMA, Rafinesque.

Nettastoma, RAFINESQUE, Caratteri Alcuni Nuovi Generi, etc., 1810, 66 (type, *Nettastoma melanura*, Raf.).—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 48.—JORDAN, Cat. Fish. N. Amer., 54, note.
Hyoprorus, KÖLLIKER, Verhandlung Phys. Med. Gesellsch. Würzburg, IV, 1854, 101.

Body scaleless, with tail tapering into a point. Snout much produced, depressed, its anterior nostrils near its tip and nearly superior, the posterior above and in front of eye. Jaws and vomer with bands of cardiform teeth, those along the median line of the vomer being somewhat the larger. Vertical fins well developed. Dorsal commencing behind gill opening; pectorals absent. Air bladder present. Gill openings moderate. (*Jordan.*)

Nettastoma parviceps, a small-headed species, most resembling *N. melanurum*, from a specimen 26½ inches long, dredged by the *Challenger* off Japan, in 345 fathoms. (Günther, Challenger Report, XXII, p. 253, pl. LXIII, fig. A.)

NETTASTOMA MELANURUM, Rafinesque.

Nettastoma melanura, Rafinesque, Caratteri, 1810, 68, pl. xvi, fig. 1.—Kaup, Apodes, 110, fig. 78.—Günther, Cat. Fish. Brit. Mus., viii, 48.—Challenger Report, xxii, 258.—Döderlein, Att. Acc. Soc., 1877, 58.—Giglioli, Elenco, 1880, 47.—Vinciguerra, Ann. Mus. Civ. Genoa, 1883, 585.—Vaillant, Exp. Scient. Travailleur et Talisman, Poissons, 83, pl. v, figs 2, 2a, 2b.
Murænophis saga, Risso, Ichth., Nice, 1810, fig. 39.
Hyoprorus messinensis, Kölliker, *loc. cit.*—Vaillant, *op. cit.*, 85.

A *Nettastoma*, with stout upper jaw, slightly projecting beyond the lower and without prominent cutaneous flap; with mouth cleft not extending behind the vertical from the orbit. Teeth strong. Tail three-fifths the length of the body. Diameter of the eye three-twentieths the length of the head. Fins margined, with black posteriorly.

This form is found in the western Mediterranean, where it has not yet been traced to any considerable depth. It doubtless is more common in the deep than in the shallow waters, for its bathybial distribution has been demonstrated in adjoining Atlantic waters.

Nettastoma brevirostris, Facciolá (Naturalista Siciliano, vi, 1887, 166, pl. iii, fig. 3) is apparently a closely allied form.

Vaillant believes that he has recognized, in two small individuals of 95 and 142 millimeters, respectively, the young of *Nettastoma*, and probably of this species, and dissents from the views of those ichthyologists who regard the *Leptocephalus* form—*Hyoprorus messinensis*—as the young, or transformed, *Nettastoma*.

VENEFICA, Jordan and Davis.

Venefica, Jordan and Davis, Rep. U. S. F. C., 1888 (1891), 651.

Closely allied to *Nettastoma*, but with snout prolonged in a slender fleshy proboscis, with the anterior nostrils at its base. The type is *N. procerum*, Goode and Bean.

VENEFICA PROCERA, (Goode and Bean), Jordan and Davis. (Figure 168.)

Nettastoma procerum, Goode and Bean, Bull. Mus. Comp. Zoöl., x, 1883, 221.—Jordan, Cat. Fish. N. Am. 1885, 55.—Günther, Challenger Report, xxii, 253.
Venefica procera, Jordan and Davis, *loc. cit.*

A *Nettastoma* with body very elongate, compressed, tapering to a very slender attenuate point; its greatest height contained nearly 4 times in the distance from the gill opening to the tip of the lower jaw, and equals half the length of the snout. Head slender, conical; jaws somewhat depressed; the upper jaw heavier and thicker, and projecting beyond the lower a distance equal to the diameter of the eye. Length of snout equals the distance from the posterior margin of the orbit to the gill opening; the cleft of the mouth extends behind the eye to a distance equal to the diameter of the orbit. On each side of the upper jaw, and in advance of the eye, are twelve pores; behind each eye are three pores, while on the median line, on the top of the upper jaw, are several pores posteriorly arranged in pairs, of which there are four, the ultimate pair being between the posterior nostrils. There is also a pair of pores upon the nape, connecting the postorbital rows, and seventeen on each side of the mandible. The mandibulary series is continued by another series extending over the cheeks and nape. The snout is provided with a slender, filamentous tip, whose length is equal to twice the diameter of the eye. The tongue is apparently absent in the specimens examined by us. The teeth are arranged as in *N. melanurum*, but exceedingly small, and much less conspicuous than in the figures of Kaup and Risso.

Dorsal fin commences above the gill opening.

The anal fin is inserted under the seventy-third dorsal ray at a distance from the snout equal to 3⅔ times the length of the head. The tail is twice as long as the body, head included. The total length of the specimen is 727 millimeters, including the nasal tip, which measures 7 millimeters.

Lateral line highly specialized, with numerous pores, corresponding in general character to those upon the head, and arranged in a deep furrow, their distances apart being about the same as in the case of those upon the head. Height of dorsal and anal fins about equal to half the height of body.

Color, apparently, brownish; peritoneum black.

The types of *V. procera* were two fishes obtained at station 325, N. lat. 33° 35′ 20″, W. lon. 76°, at a depth of 647 fathoms. Another mutilated specimen, about 190 millimeters long, was taken at station 327. This species is in many respects closely allied to the *Nettastoma melanurum* of the Mediterranean, but appears to differ from it in the greater length of the tail, the much smaller teeth, and in the presence of a filamentous nasal tip.

VENEFICA PROBOSCIDEA, (VAILLANT), JORDAN and DAVIS

Nettastoma proboscideum, VAILLANT, Exp. Sci., Travailleur et Talisman, Poissons, 1888, 89, pl. VII, fig. 3.

A *Nettastoma*, with upper jaw projecting quite beyond the lower, and prolonged in a proboscis-like tip half as long as the upper jaw and 5 times the diameter of the eye, with mouth-cleft extending far behind the orbit. Teeth small, in cardiform bands on jaws and palatines. Tail one-half to three-fifths the length of body (head included). Diameter of the eye one-twentieth the length of the head.

This, described from a single specimen obtained off Morocco, at 2,200 meters, is a small-eyed form, with fine teeth and a nasal extension. The length of the nasal tip is, essentially, an unreliable character, and the proportion of tail to body may prove to be subject to considerable individual variation.

CHLOPSIS, Rafinesque.

Chlopsis, RAFINESQUE, Ind. Itt. Siciliana, 1810, 58.—JORDAN and DAVIS, Rep. U. S. F. C., 1888, 650.
Saurenchelys, PETERS, Berliner Monatsberichte, 1864, 397.

A genus closely allied to *Nettastoma*, having the nostrils lateral, the posterior one slit-like and placed near the eye. Body scaleless. Snout much produced. Jaws, vomer, and palatine bones with several series of small, pointed teeth, those along the median line of the vomer being somewhat the larger. Vertical fins well developed; pectorals none. Nostrils lateral, the anterior near to the end of the snout, the posterior in front of the eye. Air bladder and pyloric appendages absent. (*Peters.*)

Two species are known, one, *C. equatorialis*, Gilbert, taken by the *Albatross* off the coast of Ecuador, in 401 fathoms, the other, *C. bicolor.*

CHLOPSIS BICOLOR, RAFINESQUE.

Chlopsis bicolor, RAFINESQUE, *loc. cit.*, 59.—JORDAN and DAVIS, *loc cit.*
Saurenchelys cancrivora, PETERS, *loc. cit.*—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 48.

Tail tapering into a point. Gill opening one-fifth more distant from vent than from the end of the snout. Diameter of eye one-third of the length of the snout. Length of head two-fifths of total length. Dorsal fin commencing immediately behind the gill opening. Upper jaw the longer. Vertical fins with a black margin posteriorly. Peritoneum silvery. (*Peters.*)

The unique specimen from which the above characters were taken was found by Dr. Peters, in the Berlin Museum in a jar of fishes, chiefly from India. A crab found in the stomach led Dr. Peters to believe that the fish had been misplaced, and actually had come from the Mediterranean or the Atlantic. Its resemblance to *Nettastoma* and the fact that it is not known in any shallow-water fauna lead us to believe that it is probably a deep-water form.

Family NEMICHTHYIDÆ.

Nemichthyina, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 1870, 21.

Nemichthyidæ, GILL, Arrangement, Families of Fishes, 1872, 20 (No. 263), name only.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 365.—JORDAN and DAVIS, Rep. U. S. F. C., 1888 (1891), 652.

Body very slender, somewhat compressed, tapering into a long and very slender tail, and a very long and slender neck. No scales. Lateral line consisting of pores in three series, the upper and lower alternating in position with the median row, or of a single series of widely set pores. Head resembling that of *Belone*, the head proper small, short, and rather broad, with flat top and vertical sides. Nostrils large, close together in front of the eye, without tube or flap. Jaws prolonged, beak like. Teeth in both jaws small, very numerous, close-set, retrorse. Gill openings rather large, running downward and forward, separated by a narrow isthmus. Pectorals well developed. Anal fin beginning near the vent, higher than the dorsal, becoming obsolete on the caudal filament. Dorsal beginning close behind occiput, or not far from end of pectorals. The soft rays of the fins are connected by thin membrane, instead of being imbedded in thick skin, as in the eels. Stomach not distensible. Muscular and osseous systems well developed. Abdominal cavity extends far behind the vent.

ARTIFICIAL KEY TO THE GENERA OF NEMICHTHYIDÆ.

I. Pectorals present. Gill openings separate and distinct. Jaws exceedingly attenuate; the upper the longer, and bent upward .. ..*Nemichthyinæ*

  A. Gill slits lateral, vertical. Vent close to the head. Dorsal rays slender and nearly free.

    1. Lateral line with three rows of pores. The tail ending in a long filament. Color dusky, with silvery reflections above . . . . NEMICHTHYS

    2. Lateral line with single row of pores Tail probably filamentous (but truncate, and perhaps mutilated, in all existing specimens). Color black .. ..LABICHTHYS

  B. Gill slits separate, inferior. Vent remote from head and far behind pectorals.

    1. Dorsal origin behind pectorals and above vent. Jaws moderate ....CYEMA

II. Pectorals present. Gill openings partly confluent. Vomerine teeth large . . . *Spinivomerinæ*

  A. Jaws very long, attenuate. Vomerine teeth conical . .. . SPINIVOMER

  B. Jaws moderate (snout not longer than rest of head). Vomerine teeth lancet shaped, close-set . ...SERRIVOMER

III. Pectorals absent. Gill openings separate, but reaching nearly to middle line of abdomen. Snout spatulate. Tail long and filiform ....*Gavialicipitinæ*

  A. Vent somewhat remote from throat.

    1. Teeth small, sharp, in double row in each jaw; teeth in vomer larger. ...GAVIALICEPS

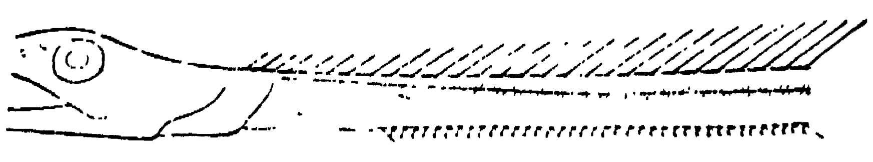
NEMICHTHYS, Richardson.

Nemichthys, RICHARDSON, Voyage of the Samarang, Fishes, 1848, 10 (type, *N. scolopaceus*).—GÜNTHER, Cat. Fish. Brit. Mus., VIII, p. 21.—JORDAN and DAVIS, Rep. U. S. F. C., 1888 (1891) 656.

Leptorhynchus, LOWE, Ann. and Mag. Nat. Hist., X, 1852, 51.

Belonopsis, BRANDT, Mém. Ac. St. Petersb. Sav. Étrang., VII, 1854, 174.

Body very elongate, with slender, whip like tail, which tapers to a point. Vent under pectorals. Jaws greatly elongate, forming a long, slender bill, the upper formed by the vomer and intermaxillaries. Inner surface of the jaws covered with small, closely set teeth. Eye large; nostrils close together in the hollow in front of the eye, without tube or flap. Gill openings wide, running downward and forward, nearly confluent. Pectoral and ventral fins well developed. Lateral line with three series of pores.



Lateral line in *Nemichthys*.

NEMICHTHYS SCOLOPACEUS, RICHARDSON. (Figure 170.)

Nemichthys scolopaceus, RICHARDSON, Voyage Samarang, Fishes, 25, Pl. x, Figs. 1–3.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 210; Challenger Report, XXII, 263.—GOODE, Proc. U. S. Nat. Mus., III, 1880, 485.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 1883, 225.—JORDAN and GILBERT, Bul. XVI, U. S. Nat. Mus., 366.—VAILLANT, Exp. Sci. Travailleur et Talisman, Poiss., 93, Pl. VII, Figs. 2, 2a.—JORDAN and DAVIS, Rep. U. S. F. C., 1888 (1891) 657.

Leptorhynchus Leuchtenbergii, LOWE, Mem. Sav. Etrangères, St. Petersburg, VII, 1854, 171.

Belonopsis Leuchtenbergii, BRANDT, *op. cit.*, 174, figure.

Head comparatively stout, its depth one-seventh its greatest length. Eye moderate, less than one-third the length of the head without snout. Length of pectoral fins slightly less than height of the anal, which is less than the height of the body and rather more than the greatest depth of the head. Pale above, belly and anal fin blackish, the color not abruptly changing, the back somewhat speckled.

This most remarkable species was first obtained by H. M. S. *Samarang* in the South Atlantic in 1846, and a little later by the indefatigable Lowe at Madeira. In 1879, when the Fish Commission had its headquarters at Gloucester, a third specimen was obtained by us from a George's Bank fisherman, who had preserved it in a whisky bottle, and who was induced to part with it in barter for a five-dollar bill.

In 1881, the *Fish Hawk* while at work in 252 fathoms off Newport, brought up a small specimen, clinging by its long jaws to the outside of the trawl net. Since then, the *Albatross* and the *Blake* have obtained numerous specimens, off the South Atlantic coast in 300 to 1,000 fathoms. Vaillant has a magnificent specimen, 650 millimeters long, obtained in 1888 meters on the Banc d'Arguin. The *Challenger* did not obtain a single specimen.

The following is a list of localities whence this species has been obtained by the *Albatross*:

No. 35632, U. S. N. M., from station 2235, in 39° 12′ N. lat., 72° 03′ 30″ W. lon., at a depth of 707 fathoms; No. 32674, U. S. N. M., from station 2002, in 37° 20′ 42″ N. lat., 74° 17′ 36′ W. lon., at a depth of 641 fathoms; No. 35401, U. S. N. M., from station 2181, in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms; No. 35617, U. S. N. M., from station 2203, in 39° 34′ 15″ N. lat., 71° 41′ 15″ W. lon., at a depth of 705 fathoms; No. 32649, U. S. N. M. (4 specimens), from station 2001, in 37° 46′ 30″ N. lat., 74° W. lon., at a depth of 519 fathoms; No. 35402, U. S. N. M., from station 2182, in 39° 25′ 30″ N. lat., 71° 44′ W. lon., at a depth of 861 fathoms; No. 35459, U. S. N. M., from station 2187, in 39° 49′ 30″ N. lat., 71° 10′ W. lon., at a depth of 420 fathoms; No. 33290, U. S. N. M., from station 2039, in 38° 19′ 26″ N. lat., 68° 20′ 20″ W. lon., at a depth of 2,369 fathoms; and from stations 2023, in 37° 48′ N. lat., 74° 01′ 30″ W. lon., at a depth of 377 fathoms; 2561, in 39° 38′ N. lat., 71° 42′ W. lon., at a depth of 500 fathoms; 2530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; 2533, in 40° 16′ 30″ N. lat., 67° 26′ 15″ W. lon., at a depth of 828 fathoms; and 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., at a depth of 677 fathoms.

Specimens were taken by the steamer *Fish Hawk*, as follows: No. 29066, U. S. N. M., from station 1048, in 38° 29′ N. lat., 73° 21′ W. lon., at a depth of 435 fathoms; No. 29073, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; No. 26106, U. S. N. M., from station 880, in 39° 48′ 30″ N. lat., 70° 54′ W. lon., at a depth of 225 fathoms; No. 28767 (2 specimens), U. S. N. M., from station 938, in 39° 51′ N. lat., 69° 49′ 15″ W. lon., at a depth of 317 fathoms; No. 28854, U. S. N. M., from station 952, in 39° 55′ N. lat., 70° 28′ W. lon., at a depth of 396 fathoms; No. 28905, U. S. N. M., from station 1025, in 39° 49′ N. lat., 71° 25′ W. lon., at a depth of 216 fathoms; No. 28761, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; and No. 28897, from station 997, in 39° 42′ N. lat., 71° 32′ W. lon., at a depth of 335 fathoms.

Specimens were also taken by the *Blake*, from station CCCIII, in 41° 34′ 30″ N. lat. 65° 54′ 30″ W. lon., at a depth of 306 fathoms; station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; station CCCVI, in 41° 32′ 30″ N. lat., 65° 55′ W. lon., at a depth of 524 fathoms; station CCCXXX, in 31° 41′ N. lat., 74° 35′ W. lon., at a depth of 1,047 fathoms; and station CCCXXXVIII, in 38° 18′ 40″ N. lat., 73° 18′ 10″ W. lon., at a depth of 922 fathoms.

A closely allied species, *N. avocetta*, has recently been discovered off the Pacific Coast.

LABICHTHYS, Gill and Ryder.

Labichthys, GILL and RYDER, Proc. U. S. Nat. Mus., v, 1883, 261.—JORDAN, Cat. Fish. N. Amer., 56.—JORDAN and DAVIS, Rep. U. S. F. C., 1888, 655.
Avocettina, JORDAN and DAVIS, Rep. U. S. F. C., 1888, 655.

Nemichthyids with the head behind the eyes contracted and with very attenuated jaws. Lateral line with a single row of pores. Branchiostegal membrane connected with the throat and the branchial apertures limited to the sides. Small conical teeth in a band along the vomer and otherwise dentition of *Nemichthys*. A black epidermis. Tail probably filamentous, but abruptly truncated in all known specimens.

LABICHTHYS CARINATUS, GILL and RYDER. (Figure 171.)

Labichthys carinatus, GILL and RYDER, Proc. U. S. Nat. Mus., VI, 1883, 261.—JORDAN, Cat. Fish. N. Amer., 57.—JORDAN and DAVIS, Rep. U. S. F. C., 1888, 656.

The ridges that bound the median rostral sulcus converge and form a carina along the median line in vertical from the anterior border of the orbit. The greatest height of the body (at posterior third) of the type specimens (0.447 meter long) is 0.013 meter, and the height behind pectorals is 0.0055 meters. Color black. (*Gill.*)

Radial formula: D. 268; A. 287; P. 13.

The type of this species (No. 33369, U. S. N. M.) was obtained by the *Albatross* from station 2076, in 41° 13′ N. lat., 65° 33′ 30″ W. lon., at a depth of 900 fathoms.

A closely allied form, *Labichthys Gillii*, Bean, (Proc. U. S. Nat. Mus. XIII, 1890, 45) was taken in 1888 by the *Albatross* in 1,569 fathoms off Alaska. It has the vent somewhat remote from the pectorals, and the dorsal origin over their tips.

LABICHTHYS ELONGATUS, GILL and RYDER. (Figure 172.)

Labichthys elongatus, GILL and RYDER, Proc. U. S. Nat. Mus., VI, 1883, 262.—JORDAN and DAVIS, Rep. U. S. F. C., 1888, 656.

The ridges that bound the rostral groove are not confluent backwards in a cariniform extension, but end in a vertical from the orbit. The greatest height of the body (at posterior third) in the type specimen (0.542 meter long) is 0.015 meter. Color black.

Radial formula: D. 346; A. 309 + x. (The anal is destroyed towards its end); P. 19. (*Gill.*)

The type of the species (Cat. No. 33577, U. S. N. M.) was taken by the *Albatross* at station 2100, in 39° 22′ N. lat., 68° 34′ 30″ W. lon., at a depth of 1,628 fathoms.

LABICHTHYS INFANS, (GÜNTHER), GOODE and BEAN. (Figure 173.)

Nemichthys infans, GÜNTHER, Ann. and Mag. Nat. Hist., 24, 1878; Challenger Report, XXII, 1884, 264, pl. lxiii, figs. B, B′, B″, B‴.
Avocettina infans, JORDAN and DAVIS, Rep. U. S. F. C., 1888, 655.

Body much less elongate and eye much smaller than in *Nemichthys scolopaceus*. Vent twice or thrice as distant from the root of the pectorals as is the latter from the eye.

This species was taken by the *Challenger* in mid-Atlantic, station 101, depth, 2,500 fathoms; one specimen 11 inches long; and off Pernambuco, station 122, depth 500 fathoms, one specimen 7½ inches long. The specimen was mutilated.

Besides these two specimens, the British Museum has received from the Mona Channel, in the West Indies, a third which was found attached to an old telegraph cable that had been laid at a depth of 114 fathoms; it is 14 inches long, but had a greater part of its body mutilated during life. This specimen, which is fairly well preserved, has been fully described by Günther in the *Challenger* Report. A copy of his figure is reproduced. (Figure 174.)

CYEMA, Günther.

Cyema, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 251; Challenger Report, XXII, 1887, 265.—JORDAN and DAVIS, Rep. U. S. F. C., 1888, 65.

This genus, says Günther, combines the form of the snout of a *Nemichthys* with the soft, short body of a *Leptocephalus;* but the gill openings are very narrow and close together on the abdominal surface. Vent in about the middle of the length of the body; vertical fins well developed, confined to and interrupted at the extremity of the tail. Pectoral fins well developed. Eye very small.

It is to be hoped that Dr. Günther will publish his views more fully upon the relation of this form to *Leptocephalus*. To a casual observer *Cyema*, as exhibited in the French and English material, seems very like a young *Nemichthys*, with its jaws and tail mutilated and partly repaired.

CYEMA ATRUM, GÜNTHER. (Figure 176.)

Cyema atrum, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 251; Challenger Report, XXII, 265, Pl. LIV, Fig. D.—VAILLANT, Exped. Travailleur et Talisman, Poissons, 91, Pl. VII, Figs. 4, 4*a*.—JORDAN and DAVIS, Rep. U. S. F. C., 1888, 654.

A specimen 4½ inches long was obtained by the *Challenger* in the South Pacific, station 215, depth 1,500 fathoms; another, 4⅜ inches long, at station 158, in the Antarctic seas, depth 1,800 fathoms. The French explorers took another, identified by Vaillant with this species, at station XXXVIII, 2,210 meters, off the coast of Morocco. This specimen is thus described by Vaillant:

> This is a little fish, 110 to 120 millimeters long and scarcely 2½ to 3 millimeters in thickness; this form has justly been compared to *Leptocephalus* by the accomplished Keeper of the Zoological Collections in the British Museum.
>
> The head is swollen, forming about one-sixth of the total length; the muzzle forms more than a half of the head; the angle of the mouth is well behind the eye; the jaws are armed with small serrated teeth disposed in quincunx and giving it the appearance of a fine file as in *Nemichthys*. The upper jaw is in large part wanting, also the extremity of the lower and their dimension can only be given approximately. It is not possible to discover the position of the nostrils. The eyes are small and the interorbital space rather large, about one-seventh of the length of the head. The narrow branchial orifices are close to the lateral line, but not confluent, and placed very near the pectorals.
>
> The anus is situated behind the middle of the total length, at the union of the anterior five-eighths with the posterior three-eighths. The skin is scaleless.
>
> The dorsal and anal are nearly opposite on the posterior part of the body, immediately behind the anus. The manner in which these fins terminate is not quite clear; in the living animal it appears to me that they are united, forming a semi-lunar fork, posteriorly wanting the ordinary caudal fin of fishes properly so called, but I am not willing to affirm that the extremity was absolutely intact, the action of the preserving fluid making the ascertainment of the fact more difficult daily.
>
> The color is a beautiful velvety black.

	Millimeters.		Millimeters.
Length	105	Tail, length	40
Height	7	Snout, length	9?
Thickness	2¼	Eye, diameter	½
Head, length	17	Interorbital width	2

The specimen is No. 84–1067, in the ichthyological collection of the Paris Museum. It was taken at station 38. Dr. Günther states that the species has been taken in depths of 3,743 and 3,262 meters in the Pacific and Antarctic oceans.

SPINIVOMER, Gill and Ryder.

Spinivomer, GILL and RYDER, Proc. U. S. Nat. Mus. VI, 1883, 261.—JORDAN, Cat. Fish. N. Amer., 57.—JORDAN and DAVIS, Rep. U. S. F. C., 1888, 653.

Nemichthyids with a rectilinear occipito-rostral outline, with very attenuated jaws, high mandibular rami, the branchial apertures nearly confluent, enlarged acute conic teeth in a median row on the vomer, and with a silvery epidermis, and a filiform tail. (*Gill and Ryder.*)

SPINIVOMER GOODEI, GILL and RYDER.

Spinivomer Goodei, GILL and RYDER, *loc. cit.*, 253, 255, 261.

The rays are ensheathed in a tough membrane which renders it impossible at present to enumerate them with exactitude. They are, however, it is to be noted, more distant from each other, and consequently fewer than in *Serrivomer*.

The fish has a silvery sheen by which, as well as by the smaller eyes and deeper mandibles, it may be at once recognized from its relations.

This is the smallest of the family, but a beautiful silvery form. The total length of the only specimen found is 0.13 of a meter, and its greatest height (at the branchial region) is 0.0025 meter. (*Gill and Ryder.*)

A single specimen (Cat. No. 33293, U. S. N. M.) was obtained by the *Albatross* at station 2039, in 38° 19′ 26″ N. lat., 68° 20′ 20″ W. lon., at a depth of 2,361 fathoms.

SERRIVOMER, Gill and Ryder.

Serrivomer, GILL and RYDER, Proc. U. S. N. M., VI, 1883, 260. JORDAN, Cat. Fish, N. A., 57. JORDAN and DAVIS, Rep. U. S. F. C., 1888, 653.

Nemichthyids with the head behind eyes of an elongated parallelogramic form, with moderately attenuated jaws, branchiostegal membrane confluent at the posterior margin, but with the branchial apertures limited by an isthmus except at the margin, and with lancet shaped vomerine teeth in a crowded (sometimes doubled) row. (*Gill and Ryder.*)

SERRIVOMER BEANII, GILL and RYDER. (Figure 175.)

Serrivomer Beanii, GILL and RYDER, Proc. U. S. Nat. Mus., VI, 1883, 260, 261. JORDAN and DAVIS, Rep. U. S. F. C., 1888, 653.

The stoutest species of the family and with much shorter jaws than any other, and with a very formidable vomerine armature. The total length of the single specimen obtained was 0.594 meter; its height at the vertical of the mandibular articulation is 0.016 meter, and the greatest height of the body (just behind the branchial apertures) is 0.02 meter.

Radial formula: D. 157; A. 138.

The specimen (Cat. No. 33383, U. S. N. M.) was taken by the *Albatross* at station 2075, in 41° 40′ 30″ N. lat., 65° 28′ 30″ W. lon., at a depth of 855 fathoms.

SERRIVOMER RICHARDII (VAILLANT), GOODE and BEAN.

Nemichthys Richardi, VAILLANT, *op. cit.*, Appendix, 93.
Avocettina Richardi, JORDAN and DAVIS, Rep. U. S. F. C., 1888, (1891) 655.
Nemichthys infans, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 95, pl. vii, figs. 1, 1a (not *N. infans* of Günther).

The description of this species given by Günther (Preliminary notice 1873, p. 251) being very brief, the example dredged from the *Talisman*, on the other hand, leaving much to be desired in the way of preservation, the affinity is doubtful.

The example, moreover, if we may be able to judge, is a little more nearly cylindrical in form. The muzzle is sharply conical, the teeth of the jaws rasp-like, similar to those of *Nemichthys scolopaceus*, Richardson. The eye appears small, nearer to the extremity of the snout than to the branchial orifice.

The vent is placed a little farther back than in the typical species of the genus; the length of the tail, compared to the total length, is in that more than ten-elevenths and only seven-ninths in the individual here described. The skin being for the greater part removed, together with a portion of the fins, some important characters are wanting. I find no trace of the dorsal, except an incomplete ray, which is a little behind the anus; the anal commences immediately behind this last. It appears to have been higher than the dorsal. The base, moreover, of the scapular bone, which supports the pectorals, alone enables us to determine the location of these fins behind the branchial aperture.

Measurements (given by M. Vaillant).

	Millimeters.	Hundredths.
Length of body	240	1
Height of body	3	1
Thickness of body	3	1
Length of head	34	14
Tongth of tail	187	78
Length of snout	13	38
Diameter of eye	14	4
Interorbital space	1	3

We find the principal character given to this species by Dr. Vaillant to be the insertion of the anus at a distance from the pectorals double that which separates the pectorals from the eye. As for the proportional elongation of the body, which is greater in the *Nemichthys scolopaceus*, Richardson, than in *Nemichthys infans*, Günther, in our example the difference is less marked.

Serrivomer Richardii is represented as having the eye one twenty-fifth of the length of the head; in *S. Beanii* the eye is much larger, forming more than one-twentieth of the length of the head. In *S. Richardii* the origin of the dorsal fin, if correctly represented, is distant from the gill-opening a space nearly equal to the length of the head, while in *S. Beanii* its distance from this point equals the length of the head. The gape of the mouth also in *S. Richardii* is apparently much wider than in *S. Beanii*, the angle of the mouth being well behind the vertical through the eye in *S. Richardi* and below the posterior margin of the eye in *S. Beanii.*

Serrivomer Richardii was taken at station 131 of the *Talisman*, off the Azores, at a depth of 2,905 meters.

GAVIALICEPS, Wood-Mason.

Gavialiceps, WOOD-MASON, with ALCOCK, Ann. and Mag. Nat. Hist., 1889, 460.

Body elongate, compressed, with long, lash-like tail. Head depressed, and snout a spatulate or needle-like beak. Teeth small, sharp, in a double row in each jaw. Vomerine teeth larger. Gill openings separate but reaching nearly to middle line of abdomen. Vent somewhat remote from throat. No pectorals.

Two species are known from the Bay of Bengal, viz: *G. tæniola*, Wood-Mason, 265 fathoms, and *G. microps*, Alcock, 1,045 fathoms.

Order LYOMERI.

Lyomeri, GILL and RYDER, Proc. U. S. Nat. Mus., vi, 1883, 263.

Fishes with five or six branchial arches (none modified as branchiostegal or pharyngeal) far behind the skull; an imperfectly ossified cranium deficient especially in nasal and vomerine elements articulating with the first vertebra by a basioccipital condyle alone; only two cephalic arches, both freely movable, (1) an anterior dentigerous one, and (2) the suspensorial, consisting of the hyomandibular and quadrate bones, without opercular elements; the scapular arch, imperfect (limited to a single cartilaginous plate), remote from the skull, and with separately ossified, but imperfect vertebræ. (*Gill.*)

Family SACCOPHARYNGIDÆ, Gill.

Saccopharyngoidei, BLEEKER, Tentamen, 1859, XXXIII (Family, 169).
Saccopharyngina, GÜNTHER, Cat. Fish. Brit. Mus., VIII, 22.
Saccopharyngidæ, GILL, Arr. Fam. Fish., 1872, 21 (No. 205); Nature, XXIX, 1884, 235; Proc. U. S. Nat. Mus., VII, 1884, 62-3.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 365.

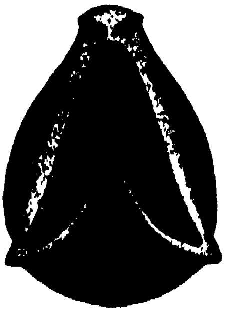
Lyomeri with the branchio-anal portion much longer than the rostro-branchial; the tail excessively elongated and attenuated; the cranium unknown; the eyes antero-lateral; with the jawbones moderately extended backward (in comparison with the Eurypharyngidæ), and apparently not closable against each other; with enlarged teeth in one or both jaws; with the dorsal and anal fins feebly developed, and with pectorals small but broad.

Saccopharynx is considered by Dr. Günther to consist of "deep-sea congers," but evidently it is not at all related to the congers or any other allied fishes. (*Gill.*)

SACCOPHARYNX, Mitchill.

Saccopharynx, MITCHILL, Ann. Lyc. Nat. Hist. N. Y., I, 1824, 86 (type, *Saccopharynx flagellum*, Cuvier).—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 22; Challenger Report, XXII, 1887, 255.—GILL, *op. cit.*, 46.
Ophiognathus, HARWOOD, Phil. Trans. Royal Soc., 1827, 52.

Saccopharyngids with the dorsal and anal fins continued backwards and confluent with a slightly developed caudal fin [?], and with the lower jaw toothless.



FRONT VIEW OF HEAD OF SACCOPHARYNX.

We unite the various forms of Saccopharynx under one specific name, pending the discovery of new material which may render an intelligent discussion possible.

SACCOPHARYNX FLAGELLUM, MITCHILL. (Figures 178, 179, 180.)

Saccopharynx, MITCHILL, Ann. Lyc. Nat. Hist., New York, I, 1824, 82.
Saccopharynx flagellum, ("MITCHILL.")—CUVIER, Regne Animal, 2d ed., 1829, II, 355.—GÜNTHER, Cat. Fish. Brit. Mus., VIII, 22.—JOHNSON, Ann. and Mag. Nat. Hist., 1862, X, 279.—GILL, *loc. cit.*, 64.
Ophiognathus ampullaceus, HARWOOD, Phil. Trans., 1827, 52, pl. VII, Figs. 1-4.
Saccopharynx ampullaceus, RICHARDSON, Fauna Boreali-Americana, 1836, III, 271.—GÜNTHER, Challenger Report, XXII, 1887, 256, pl. LXVI.

Both jaws are armed with slender, curved, widely set teeth, irregularly uniserial or biserial, their points being directed inward. The length of the jaws is from one-third to one-seventh of the length of the body; that is, the distance from the vent to the extremity of the snout. The dorsal fin commences a long way behind the head and a short distance in front of the vent; like the anal it may or may not reach the end of the tail, which terminates in an extremely delicate and thin filament. The small pectoral fin with some thirty very thin rays. Gill-opening an elongate slit. A bluish-white line runs on the back along each side of the base of the dorsal fin, and a similar line is sometimes distinct along the anal fin. (*Günther.*)

Of this genus five specimens have been captured; described by Dr. Günther as follows. There may, of course, be two species, for it is not certain that Mitchill and Harwood both saw the same form.

(1) The fish described by Mitchill in 1824, which was taken in 52° N. lat., 30° W. lon.; it was discovered afloat in a helpless condition, having swallowed a fish 10 inches long. The body of this specimen was 14 and the tail 58 inches long. It does not seem to have been preserved.

(2) The fish described by Harwood in 1827, which was taken in 62° N. lat., 57° W. lon.; it was discovered afloat in a helpless condition, "almost worn out by unavailing efforts to gorge a fish of about 7 inches in circumference." This is the largest of the specimens known, its body having been about 20 and the tail 34 inches long. It does not seem to have been preserved.

(3) The fish described by Johnson in 1862, which was taken off Madeira, under what circumstances Johnson could not learn, but probably also floating on the surface; it had swallowed another deep-sea fish about 9 inches long (*Halargyreus Johnsonii*), the stomach of which was forced up into the mouth by the distended air bladder, showing how rapidly both fishes must have ascended to the surface. The body of this specimen is 8½ and the tail 23 inches long. It is preserved in the British Museum.

(4) A young specimen in the British Museum, the history of which is unknown; its body is 3, its tail 8½ inches long. It is much shriveled, having been preserved for a long time, but supplies some valuable information on points in which the larger is imperfect.

(5) A single badly mutilated specimen, secured by the *Blake* from station CCCXXXI, in 35° 44′ 40″ N. lat., 74° 40′ 20″ W. lon., at a depth of 898 fathoms.

Dr. Günther's description applies, no doubt, to *S. ampullaceus*. His figure is reproduced in our figure 178.

Family EURYPHARYNGIDÆ.

Nouvelle famille, VAILLANT, Comptes Rendus. Acad. Sc., Paris, Dec. 11, 1882, p. 1226 (not named).
Eurypharyngidæ, GILL, Science, I, 231, March 30, 1883.—GILL and RYDER, Proc. U. S. Nat. Mus. VI, 1883, 264.—VALLIANT, Exp. Sci. Travailleur et Talisman, 1888, 193.

Lyomeri with the branchio-anal portion much shorter than the rostro-branchial; with the tail very elongated and moderately attenuated backwards; the head flat above, and with a transverse rostral margin, at the outer angles of which the eyes are exposed; with the palatine jaws excessively elongated backwards and the upper parallel, and closing against each other as far as the articulation of the two suspensorial bones; with minute teeth on both jaws; the dorsal and anal fins well developed and continued nearly to the end of the tail, and with minute, narrow pectoral fins.

The mandibular rami are exceedingly narrow and slender, but the jaws are extremely expansible and the skin is correspondingly dilatable; consequently an enormous pouch may be developed. Inasmuch as the slenderness and fragility of the jaws and the absence of raptorial teeth (at least in *Gastrostomus*) preclude the idea of the species being true fish of prey, it is probable that they may derive their food from the water which is received into the pouch, by a process of selection of the small or minute organisms therein contained.

The peculiar closure of the anterior half of the upper jaws upon each other, and the coördinate joint between the hyomandibular and quadrate elements of the suspensorium are doubtless correlated with the mode of ingestion or selection of food. The skin constituting the pouch, it may be added, has a peculiar velvety appearance, and also reminds one of the patagium or wing membrane of a bat. (*Gill and Ryder.*)

EURYPHARYNX, Vaillant.

Eurypharynx, VAILLANT, Comptes Rendus Acad. Sc., Paris, 1232, Dec. 11, 1882, (tr. Ann. & Mag. Nat. Hist. (5), V, 11, p. 67; Exp. Sci. Travailleur et Talisman, 197; GILL and RYDER, *loc. cit.*, 274.

Eurypharyngids with the cranium greatly abbreviated, the dentigerous bones very elongate, nearly one-half the length of the body; feeble granulations upon the jaws, and a pair of enlarged teeth on the lower jaw in front. Gill-opening remote from angle of mouth.

No traces of a lateral line. Vent premedian. Rays of vertical fins slender and flexible. Tail free, terminating in slender point.

EURYPHARYNX PELECANOIDES, VAILLANT. (Figure 176.)

Eurypharynx pelecanoides, VAILLANT, Comptes Rendus Acad. Sc., Paris, xcv, 1226, Dec. 11, 1882; Exp. Sci. Travailleur et Talisman, 198, pl. xvii.—GILL and RYDER, *loc cit.*
Siccopharynx pelecanoides, GÜNTHER, Challenger Report, xxii, 1887, 262.

Both jaws possess merely feeble dental granulations, but the lower jaw is armed in front with a pair of slender curved teeth (2 millimeters long). The length of the jaws is about one half of that of the body. The origin of the dorsal fin is nearer to the end of the snout than to the vent; neither the dorsal nor the anal fin reach the end of the tail (which terminates in a small, skinny lobe). Gill-opening a very small round opening. No bluish-white line along the back. (*Günther.*)

"This animal," writes Gill, "is about 0.47 meter long and 0.02 meter high at the most elevated part and is of an intense deep black color. The body, the form of which is masked in front by the abnormal mouth, which will be mentioned further on, resembles that of *Macrurus;* it becomes regularly attenuated from about the anterior fourth, the point at which the external branchial orifice is seen, and terminates in *a point* at the caudal extremity; the anus is situated at the junction of the anterior third with the posterior two thirds of the body.

"What gives this fish a very peculiar physiognomy is the arrangement of the jaws and the structure of the mouth, which are even an exaggeration of what Mr. Ayres has described in *Malacosteus niger.* Although the head is short (scarcely 0.03 meter), the jaws and the suspensorium are excessively elongated; the latter did not measure less than 0.095 meter; and from this it results that the articular angle is carried very far back, to a distance from the end of the muzzle equal to about 3½ times the length of the cephalic portion."

GASTROSTOMUS, Gill and Ryder.

Gastrostomus, GILL and RYDER, Proc. U. S. Nat. Mus., 1883, vi, 271-273.

Eurypharyngids with the cranium abbreviated and little or no longer than broad, minute acute conic teeth depressed inward in a very narrow band on the jaws (no enlarged teeth at the extremity of the mandible), and the tail with an eradiate membrane under its terminal portion. Gill-opening close to angle of mouth.

GASTROSTOMUS BAIRDII, GILL and RYDER (Figures 181, 182.)

Gastrostomus Bairdii, GILL and RYDER, Proc. U. S. Nat. Mus., 1883, vi, 271.

The cranium forms about one-thirtieth or less of the extreme length, and is as broad as long; the jaws are excessively elongated, being nearly (in large) or more (in young) than 7 times longer than the cranium; there are about 160 rays in the dorsal fin and about 107 in the anal; the pectorals are very small, being only about as long as the diameter of the eye, and little more than twice as long as wide at the base, and have about nine simple rays. The rays of the unpaired fins are quite flexible in the small individuals, but quite rigid and more perfectly ossified in the larger; they become obsolete toward the end of the tail. The rays, which are rigid and well ossified anteriorly, become shorter, very slender, and flexible—in fact, almost as limp as threads near the end of the tail. The vertebral bodies become longer and more attenuated toward the end of the tail.

	Meter.		Meter.
Extreme length	.47	**Cranium:**	
Body:		**Length**	.015
Height at branchial region	.035	**Width**	.015
Height at anus	.025	**Interorbital area**	.011
Height at commencement of anal fin	.02	**Orbit, diameter**	.003
Length of abdominal cavity	.05		

	Meter.
Jaw:	
Upper, length	.103
Lower, length	.103
Suspensorium, length	.102
Branchial aperture:	
From snout	.11
From dorsal	.028
Interbranchial isthmus, width	.0035
Dorsal:	
From snout	.07
Longest ray	.0075

	Meter.
Anal:	
From snout	.175
Longest ray	.015
Pectoral:	
Distance from branchial aperture	.002
Distance from anus	.04
Distance from snout	.115
Length	.0035
Width (at base)	.0015

The following specimens were taken by the *Albatross:* Cat. No. 33294, U. S. N. M., from station 2047, in 40° 2′ 30″ N. lat., 68° 49′ 40″ W. lon., at a depth of 389 fathoms; Cat. No. 33295, U. S. N. M., from station 2043, in 39° 49′ N. lat., 68° 28′ 30″ W. lon., at a depth of 1,467 fathoms; Cat. No. 33386, U. S. N. M., from station 2074, in 41° 43′ N. lat., 65° 15′ 20″ W. lon., at a depth of 1,309 fathoms; Cat. No. 35407, U. S. N. M., from station 2179, in 39° 30′ 10″ N. lat., 71° 50′ W. lon., at a depth of 510 fathoms; Cat. No. 35521, U. S. N. M., from station 2210, in 39° 37′ 45″ N. lat., 71° 18′ 45″ W. lon., at a depth of 991 fathoms; Cat. No. 35525, U. S. N. M., from station 2211, in 39° 35′ N. lat., 71° 18′ W. lon., at a depth of 1,064 fathoms; Cat. No. 33545, U. S. N. M., from station 2096, in 39° 22′ 20″ N. lat., 70° 52′ 20″ W. lon., at a depth of 1,451 fathoms; Cat. No. 35621, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; and Cat. No. 35528, U. S. N. M., from station 2206, in 39° 35′ N. lat., 71° 24′ 30″ W. lon., at a depth of 1,043 fathoms.

Doubtfully placed in Saccopharyngina by Alcock.

(Apparently true **Apodes.**)

DYSOMMA, Alcock.

Dysomma, ALCOCK, Ann. & Mag. Nat. Hist., 1889 (Nov.), 459; Bathybial Fishes of the Bay of Bengal, 35.

Soft tissues well developed; osseous tissues weak. Body high anteriorly and the head much inflated. Tail tapering to a point. Vent situated immediately behind the gill-opening. Snout short, slightly overhanging the mouth, its surface with many pores. Eyes minute, concealed beneath the skin. Nostrils large, lateral. Cleft of mouth wide. Minute sharp teeth in a single row in each jaw; a row of larger teeth in the vomer. Tongue not free. Four gills, communicating with the pharynx by wide slits. Osseous elements of the gill-cover rudimentary or absent. Gill-openings separate. Heart situated between the gills. No scales. Vertical fins fairly developed, the dorsal beginning just behind the occiput. Pectorals well developed. (*Alcock.*)

A single species, *Dysomma bucephalus,* Alcock, represented by one specimen, 8¾ inches long, taken in the Bay of Bengal, in 193 fathoms, lat. 20° 17′ 30″ N., lon. 88° 51′ E., by the *Investigator,* and another from station 120, in 240 to 276 fathoms.

DYSOMMOPSIS, Alcock.

Dysommopsis, ALCOCK, Ann. & Mag. Nat. Hist. (6th ser.), VIII, 1891, 137.

A genus allied to *Dysomma,* having a tail of great relative length, the vent being close to the gill-opening. Eyes small, deeply subcutaneous. Snout studded with pores. Nostrils large, lateral. Mouth wide. Small sharp teeth in a single row in the lower jaw, and in a double row in the upper jaw; a short row of enlarged teeth in the vomer. Four gills; gill clefts wide; gill-openings small, situated close together near mid-abdominal line. Heart between the gills. Skin scaleless. Vertical fins confluent, the dorsal beginning a short distance behind the gill-opening. No pectorals. (*Alcock.*)

The genus is represented by *D. muciparus,* Alcock, obtained by the *Investigator* in the Indian Ocean, station 120, in 240 to 276 fathoms.

Order CARENCHELYI.

Carenchelyi, GILL, MS.

Teleost fishes with the intermaxillaries and supramaxillaries developed and united by suture, and immovably connected with the cranium; branchial apparatus as in Apodes; scapular arch remote from the skull, and the body anguilliform. (*Gill*, MS.)

Family DERICHTHYIDÆ.

Derichthyidæ, GILL, American Naturalist, v, 18, 433, 1884.

Body anguilliform, slender, with a neck-like contraction between the head and pectoral fins, and submedian anus. Scales absent, the skin being perfectly smooth. Lateral line commencing on the side, behind the head, near the back, but submedian behind.

Head oblong, oval. Eyes in the anterior half of the head. Nostrils lateral, in front of the eyes; neither tubular. Mouth with the cleft little oblique, extending behind the eyes. Jaws well developed, maxillaries approximated to the front of the vomer and attenuated backwards. Mandible moderately stout; the dentary with the coronoid process moderate and not far from posterior end. Teeth conic, in cardiform bands on the jaws and vomer. Lips moderate. Tongue moderate. Periorbital bones.

Opercular apparatus moderately developed; operculum inserted rather low on the hyomandibular by a peduncle, horizontally oblong, with emarginate upper edge and convex lower one; suboperculum curved and applied below operculum; interoperculum long, connected in front with angle of jaw and behind with front of suboperculum; preoperculum moderate.

Branchial apertures lateral; vertical slits in front of pectorals.

Branchiostegal rays in small number (about 6), rather slender and curved upwards behind the opercula.

Dorsal, anal, and caudal confluent in an uninterrupted fin; dorsal commencing far behind the head; anal commencing about midway between snout and end of tail or middle of body; caudal pointed and reduced.

Pectorals inserted nearer the breast than back, narrow and rather long, with about 10 or 11 fine rays, and bent forward.

Branchial arches slender; glossohyal moderately long; urohyal very slender and pointed; first basibranchial very long; second and third basibranchials moderate; epipharyngeals reduced to a pair (?); hypopharyngeals long and closely appressed and superincumbent on the rudimentary fifth arch.

DERICHTHYS, Gill.

Derichthys, GILL, American Naturalist, XVIII, 1887, 433.

The generic characters are included in the family diagnosis.

DERICHTHYS SERPENTINUS, GILL. (Figure 169.)

Derichthys serpentinus, GILL, American Naturalist, XVIII, 1887, 433.

Body stout, somewhat compressed, especially behind the vent; its greatest height in the region of the vent nearly equal to the length of the head; its postanal portion equal to the distance from the vent to the posterior margin of the orbit.

Head small, snake-like, its resemblance to that of a serpent being enhanced by the contracted neck-like appearance of the anterior portion of the body. Its anterior portion is depressed, and the view from above abruptly truncate, the width of the tip of the snout being considerably greater than the interorbital space. The lower jaw is narrower and included, the upper jaw projecting beyond its tip a distance nearly equal to the diameter of the eye. The length of the snout is one third that of the head. The cleft of the mouth extends behind the eye a distance equal to or slightly greater than the diameter of the orbit.

Nostrils elongate, the exterior slit occupying the middle third of the space between the anterior margin of the orbit and the tip of the snout. Length of the neck four-fifths that of the head, equal to the distance from the posterior limit of the nostril to the posterior portion of the head. Pectorals inserted high up, almost in median line, and composed of two or three flexible, filiform rays. Origin of the dorsal about midway between the vent and the tip of the snout, the fin composed of flexible, delicate rays, not sufficiently differentiated from the thin membrane as to be easily counted, those rays being longest in the region above the vent.

Vent nearly median. Anal fin beginning immediately behind the vent, and similar in height and appearance to the dorsal fin, which it apparently joins at the tip of the tail. No ventrals.

Lateral line inconspicuous, with minute pores, though its location is emphasized by the Amphioxus-like arrangement of the muscular fibers. Length of type 8 inches; of head, one-half inch; of region in advance of pectorals, 1 inch; greatest height, seven-sixteenths of an inch. Color, in life, ruddy brown; in alcohol, light yellow.

A single specimen (Cat. No. 33523, U. S. N. M.), was obtained by the Fish Commission steamer *Albatross*, from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1,022 fathoms.

Order HETEROMI.

Notacanthi, Bleeker, Tentamen, 1859, xxiii (in part).
Heteromi, Gill, American Naturalist, Nov., 1889, 1016.

Teleosts with the scapular arch formed by the proscapula and post temporal (or posterotemporal), the latter detached from the sides of the cranium and impinging on the supraoccipital; the hypercoracoid and hypocoracoid coalesced into a single lamellar imperforate plate; the actinosts normal; the cranium with the condyle confined to the basioccipital (ill-defined); the exoccipitals coalesced with the epiotics and opisthotics; the vomer obsolete; the opercular apparatus complete, but the preoperculum slightly connected with or discrete from the suspensorium; the suborbitals suppressed; the jaw bones complete and little aberrant; the palatines, entopterygoids, and ectopterygoids well developed; the anterior vertebræ separate, and the ventrals abdominal. (*Gill.*)

All the heteromous teleosts have a subfusiform, moderately compressed body with head short and snout protruding, sometimes produced, proboscis-like (as in *Polyacanthonotus*).

Family NOTACANTHIDÆ.

I Notacantini, Rafinesque, Indice d' Ittiologia Siciliana, 1810, 34.
Notacanthini, Bonaparte, Cat. Metodico, 1876, 72.
Notacanthoidei, Bleeker, Tentamen, 1859, xxiii.
Notacanthi, Günther, Cat. Fish. Brit. Mus., iii, 1861, 544.
Notacanthidæ, Gill, Arr. Fam. Fish, 1872, 21; Johnson's Cyclopedia, iii, 1883; Century Dictionary, 4022.—Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 370.

Mouth moderate, transverse, inferior. Lower jaw normal, with rami immovably connected at symphysis. Scales small on body and head; lateral line present. Teeth slender, closely set, in single series in each jaw. Gill openings wide, the membranes separate and free from the isthmus.

Dorsal fin median, with short and free dorsal spines, and with only one ray (if any) behind. Anal fin long, rather high, extending from the middle of the body to the caudal, with which it unites, and with numerous spinous rays. Ventrals abdominal, often confluent, with 1–5 spines and 4–8 soft rays. Pectorals short and high up. Pseudobranchiæ none.

The elaborate anatomical description of *Notacanthus sexspinis*, given by Günther (Challenger Report, xxii, 243-8) with numerous excellent figures, applies in its general features to all the members of this family. In the discussion of the genera and species below, little attention has been given to the degree of connection of the ventral fins. In every instance they are connate or confluent, but the degree of connection depends not so much upon their proximity to each other as upon the extent of the connecting membrane in the several forms, and we question whether the character can be so defined as to serve even for specific distinctions. All the species examined by us have the peculiar modifications of the posterior extremities of the maxillary, and the sharp spine more or less hidden by the fleshy fold of the lips at the angle of the mouth on either side.

KEY TO THE GENERA OF NOTACANTHIDÆ AND LIPOGENYIDÆ.

I. **Jaws normal. Dorsal spines separated. Teeth in both jaws** ....NOTACANTHIDÆ
  A. **Dorsal spines 6-12. Teeth in upper jaw compressed and obliquely triangular. Ventrals connate or confluent** ....*Notacanthinæ*
    1. **Origin of spinous dorsal far in advance of vent. Mouth lateral with lip continuous. Ventral fins connate or confluent** ....NOTACANTHUS
    2. **Origin of spinous dorsal in vertical from vent. Mouth subinferior, crescentic, with lip absent in middle. Jaws each with 22 teeth. Ventral fins united** ....GIGLIOLIA
  B. **Dorsal spines 27-38. Teeth in jaws erect, fine. Ventrals separated** ....*Polyacanthonotinæ*
    1. **Snout proboscis-like. Dorsal and anal spines long, flexible, the latter not exceeding 30 in number. Lateral line strongly arched** ..........................POLYACANTHONOTUS
    2. **Snout not very elongate. Dorsal and anal spines low and strong, the latter 50 or more in number. Lateral line straight** ....MACDONALDIA
II. **Jaws modified to form a suctorial mouth with separated rami. Dorsal spines close together, united by membrane to form a high triangular fin. No teeth** ....LIPOGENYIDÆ
  A. **Dorsal spines 5, with 5 soft rays.**
    1. **Lateral line obsolete behind** ....LIPOGENYS

NOTACANTHUS, Bloch.

Notacanthus, BLOCH, Abhandl. Böhm. Gesellsch, 1787.—LACÉPÈDE, Hist. Nat. Poiss., 1804.—GOODE, Proc., U. S. N. M., 1880, 535.

Acanthonotus, BLOCH, Ichthyologia, XII, 1797, 113, pl. CCCCXXXI. (No description separate from that of species *A. nasus*.)—SCHNEIDER, Bloch's Syst. Ichth., 1801, 390, pl. XLVII.

Campylodon, FABRICIUS (fide GÜNTHER).

Head and body much compressed, the body elongate, snout obtuse, rounded at its tip, not proboscis like. The cleft of the mouth inferior. Dorsal fin almost rudimentary, consisting of 12–15 very short, flexible spines, remote from each other and not connected by a membrane. Anal fin very long, its origin close behind the vent, which is situated nearly midway of the length of the body; its anterior portion is composed of separate, flexible spines, without membrane, resembling those of the dorsal; these gradually lengthen, grading into the articulated branched rays. No caudal. Ventrals broad, with broad, peduncle-like bases, closely contiguous, separated only by a slight groove at the base, situated near the vent. Teeth acicular, in single row upon maxillaries, in a double row upon mandibulars, villiform and in double row upon the palatines. Scales very numerous, of moderate size, round, thin, flexible. Branchiostegals about 8. Gills, 4.

Notacanthus sexspinis, Richardson, as figured by Günther in the Challenger Report, has 8 dorsal spines (the last with supplementary ray), instead of the 6 indicated by its specific name; and this is the case also with the New Zealand specimen in the National Museum, presented by Dr. Günther, and one from Cook Strait, New Zealand, in the Museum at Florence, which is 440 millimeters in length, and has a radial formula: D. 8; A. 13/126; P. 12; V. 1/8; C. 5. These specimens do not show the inflation of the cheeks, figured in Dr. Günther's plate.

The results of Dr. Günther's dissections seem to indicate that this species at least of *Notacanthus* does not live at a very great depth.

KEY TO THE SPECIES OF NOTACANTHUS AND GIGLIOLIA.

I. **Origin of dorsal considerably in advance of that of anal. Lip normal, continuous** ....NOTACANTHUS
  A. **Body much higher over ventrals than over pectorals, and comparatively short.**
    1. **Lateral line following profile of back in front of dorsal spines, then sinking to median line of body. D. X–XI.**
      a. **First dorsal spine behind vertical from axil of ventral. A. XIII–XV. (XVII?)** ....*N. nasus*
      b. **First dorsal spine in front of vertical from insertion of ventral. A. XVII** ....*N. analis*
  B. **Body little higher over ventrals than over pectorals, and comparatively elongate.**

1. Lateral line inconspicuous, nearer to dorsal than to ventral outline throughout, not arched anteriorly. D. VI–VIII.
    - a. Last dorsal spines over anterior part of soft anal. A. XII .... *N. Bonapartii*
    - b. Dorsal and soft anal not passing same vertical. A. XIII–XIV .... *N. sexspinis*
2. Lateral line slightly arched above pectoral, sinking to median line of body in advance of first dorsal spines. D. X.
    - a. Last dorsal spine over fifth from last anal spine. Fins low. A. XIX .... *N. phasganorus*

II. Origin of dorsal opposite that of anal. Lip absent in middle portion .... GIGLIOLIA
- A. Body much higher over ventrals than over pectorals and comparatively short.
    - 1. Lateral line arched over ventrals and pectorals. D. VIII.
        - a. Snout thick, swollen. A. XV–XVIII .... *G. Moseleyi*

NOTACANTHUS NASUS, BLOCH. (Figure 183).

Acanthonotus nasus, BLOCH, Ausl. Fische, XII, 114.—SCHNEIDER, Bloch's Systema Ichthyologiæ, 1801, 390.

Notacanthus nasus, BLOCH, Fische, VII, 113, pl. 431.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, 467, pl. CCXLI.—LÜTKEN, Vid. Med., 1878, 145.—GÜNTHER, Cat. Fish. Brit. Mus., III, 544; Challenger Report, XXII, 248.—GIGLIOLI, Elenco, 94.—VAILLANT, Exp. Sci. Travailleur et Talisman, 317.

Campylodon Fabricii, REINHARDT, Vidensk. Selsk. Afhandl., 1838, 120.

Notacanthus Chemnitzii, (BLOCH, Abh. Bohm. Gesellsch. 1787).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 370.

A *Notacanthus* with elongate body, whose greatest height lies between the pectoral and ventral fins and is contained about 4½ times in the distance from the vent to the tip of the snout. Head, short, compressed, its length not quite 3½ times in distance from vent to snout. Mouth large, extending backward to a point nearly under the eye, the maxillary nearly to the vertical from the anterior margin of pupil. The mouth does not lie entirely on the under portion of the head, but is sublateral. There are 35 teeth in the intermaxillaries on each side. The distance between the upper profile of the head and the eye is about equal to the diameter of the eye, and the diameter is slightly greater than one-third the length of the snout (certainly not more than one-half the length of the snout), and about one-eighth the length of the head. (In this connection, it is taken for granted that the hole in the skin of the head represents the size of the eye; if, however, we assume that the entire portion free of scales is the eye, the diameter is greater and equal to one-sixth the length of the head. It is, at any rate, considerably less than the width of the interorbital space.) The gill cover appears to be divided to below the symphysis of the operculum (with hyomandibular), and is free from the isthmus (the entire under portion of the head is cut open in the middle).

Scales are lacking only about the mouth and eyes; about 40 longitudinal rows of small scales (2 millimeters broad, 4 millimeters long) between the ventral outline and the lateral line; smooth, and imbricated.

Of the 11 dorsal spines, the first (overlooked by Bloch and Valenciennes) is very small and only visible as a point; placed close to this (1 millimeter) is the second, which is also very short and feeble. The third, though also short, is thicker. The vent lies behind the fifth spine. Of the 15 anal spines, which have their origin immediately behind the vent, the first (overlooked by Bloch and Valenciennes) is very small; it does not extend beyond the profile; the second and third but slightly. The spines which are longest and placed farthest back still bear traces of a connecting membrane and are probably only worn-off rays. The pectorals are inserted somewhat farther back from the gill covers than shown by Bloch; the end is surely broken off, but yet it can hardly be doubted that this fin is too long in Bloch's figure; its base is less than one-sixth the length of the head. The ventral fins, connected behind the median line by a membrane, terminate considerably in advance of the vent (they are apparently worn off a little behind).

Radial formula: D. xi; A. 15 + 118 C.?; P. 19; v, 3 + 7 (l), 8 (r).—Branchiostegals, VIII, (r)—IX (l).

Total length (restored) 85 centimeters. Length of head about 10.7 centimeters. Height of body about 8 centimeters. Length of tail about 47.5 centimeters.

The full diagnosis given above was furnished by our friend Dr. Franz Hilgendorf, Custos of the zoölogical collections in the Royal Museum of Natural History, Berlin, who also gave the following notes on the present condition of the types:

The original Bloch specimen (Cat. Gen., No. 1409) is still in existence (our Museum possesses in addition to this only a single specimen of *Notacanthus*—*Notac. sexspinis*), but it is in a very unsatisfactory condition. It was, perhaps, injured in transportation from Paris. The jar has not been opened for more than thirty years. Very likely Bloch received it in a poor state of preservation—a large cavity in the belly, between the pectorals and ventrals, a dilapidated left cheek, injured eyeballs, intestines wanting, etc. In addition to this, there are other defects of a later date, such as the loss of the caudal, the tip of the snout, the maceration of the frontal bones. The gill arch is almost entirely gone; the intestines altogether. The frontal bone is crushed and the first vertebra is disconnected. There is a long gap in the dorsal fin.

The actual length is now 82 centimeters; in addition to this should be added, at the most, 1 centimeter for the snout and ⅜ centimeter for the caudal fin. This makes its former length about 85 centimeters. (Bloch says 2½ feet; this would be, according to the Rhenish [*i. e.* Prussian] measure, only 78½ centimeters. Perhaps Bloch used a longer foot, or he gave only an approximate measurement.) As we have no other specimen which we might have confounded with that of Bloch, and ours still bears the label (apparently in Troschel's handwriting) "*Notacanthus nasus*, Iceland, Bloch," I have no doubt that No. 1409 is the type specimen. Nor can there have been another in Paris.

How much of the end of the caudal is missing is difficult to say. The point of the fracture is hard and the fin bones are soft. If Valenciennes's account is accurate, the caudal *fin* only is missing, and one or two rays of this are still attached. If Bloch's description is correct, there were 149—(13+8 or 10?) 126–128 rays in the anal; consequently, a caudal end, with at least 10 rays, in addition to the caudal fin, was lost, and the fish would have been somewhat longer than 85 centimeters. I presume there was an oversight on Bloch's part.

The material now classed by authors under the name of *N. nasus* is the following: (1) A specimen described by Fabricius in 1798 under the generic name of *Campylodon*, obtained in 1791 from Greenland; (2) Bloch's type in the Berlin Museum, believed by him to come from the West Indies, described under the names *N. Chemnitzii* (?), *N. nasus*, and *Acanthonotus nasus*; (3) A specimen, obtained off Iceland by *La Recherche* and brought by Gaimard to the Paris Museum, figured in the Règne Animal, and said to have been figured also in the Voyage in Scandinavia. This, as has already been stated, is possibly a typical *N. nasus*; (4) A specimen, 3 feet long, obtained in South Greenland, and brought in 1877 to the Copenhagen Museum. This also is possibly not a characteristic representative of the species.

Both Canestrini and Giglioli enumerate *Notacanthus nasus* among Mediterranean fishes, but entirely without authority.

NOTACANTHUS ANALIS, GILL. (Figures 181; 191 A–B.)

Notacanthus analis, GILL, Proc. U. S. Nat. Mus., VI, 1883, 255. GÜNTHER; Challenger Report, XXII, 248, note.—VAILLANT, Exp. Sci. Travailleur et Talisman, 318, *et seq.*—JORDAN and GILBERT, Cat. Fish. N. Amer., 1885, 58.

A *Notacanthus*, with its body much higher over ventrals than over pectorals, and comparatively short, its height equal to one-third of the distance from the vent to the tip of the snout, and nearly equal to the length of the head, the lateral line arcuate in front of the dorsal spines, following profile of the back and then sinking to the median line of the body. First dorsal spine in front of vertical from insertion of ventral.

The snout is compressed, pointed, much produced beyond the moderate mouth. The cleft extends nearly to the vertical through the middle of eye. The length of the snout is 1½ times the diameter of the eye. The width of the interorbital area is slightly less than the diameter of the eye. The projection of the snout beyond the mouth is equal to the diameter of the eye or nearly so. The snout is compressed, not swollen. Mouth narrow, transverse, its width about one fourth the length of the head. The eye is placed some distance below the upper profile and in the line of the lateral line continued to the nostrils. Gill opening wide; the membranes confluent and slightly in advance of the vertical from the upper end of the gill opening; not attached to the isthmus. Scales very minute, imbricated, adherent.

All the dorsal spines are short, the anterior very short; the second and first nearly over the origin of the ventrals, the fifth above the vent and the sixth slightly behind the origin of the anal. The longest about one-half as long as the eye. The last (eleventh), which is followed by a single ray attached to it by membrane, is over the fifteenth spine of the anal. The dorsal spines are distant from each other, and behind each is a narrow angular membrane. The anal begins immediately behind the vent, and in its middle portion is considerably elevated; the length of its longest rays is about equal to that of the snout, from which point it slopes rapidly to the tip of the tail. The pectoral, placed high up in the middle axis of the body, is inserted at some distance behind the gill openings, and is broad and nearly oval in shape. Ventrals confluent, some distance in advance of the vent, stout, broad, ovate in form, not extending to the vent, but separated from it by a distance equal to half their own length. Color, uniform light brown.

Radial formula: D. XI; A. XVIII.

This description is prepared from the types of Gill, (Cat. No. 37856, U. S. N. M.,) from *Albatross* station 2677, N. lat., 32° 39′, W. lon. 76° 50′ 30″, in 478 fathoms. The types, two in number, measure 11½ and 12½ inches, respectively. Another specimen, Cat. No. 44246, U. S. N. M., was obtained by the *Albatross* from station 2676, in 32° 39′ N. lat., 76° 01′ W. lon., at a depth of 407 fathoms.

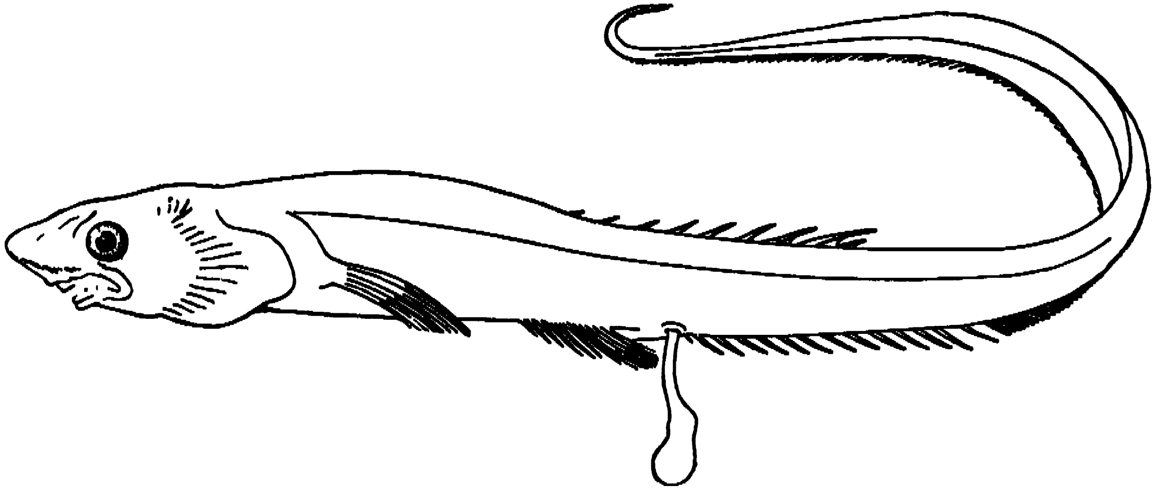
NOTACANTHUS BONAPARTII, Risso. (Figure 185.)

Notacanthus Bonaparte, Risso, Wiegm. Archiv f. Naturgesch., 1840, 376, pl. x.

Notacanthus Bonapartii, De Filippi & Verany, Mem. Acc. Sci. Torino, XVIII, 1857, 180.—Canestrini, Pesci d'Italia, 118.—Moreau, Hist. Nat. Poiss. France, 1881, 161.—Giglioli, Elenco, 33.

Notacanthus mediterraneus, De Filippi and Verany, Memor. Accad. Sci. Torin., 2nd series, XVIII, 1859. 190 (*nota supra*); Alcuni Pesci del Mediterraneo, 1857, 3.—Günther, Cat. Fish. Brit. Mus., III, 545.—Canestrini, Pesci d'Italia, 1872, 118.—Moreau, Hist. Nat. Poiss. France, 1881, III, 158 (woodcut).—Vaillant, Exp. Sci. Trav. et Tal., 317, 325; pl. XXVII.

A *Notacanthus*, with body slender, comparatively elongate, little higher over ventrals than over pectorals; with its lateral line inconspicuous, nearer to the dorsal than to the ventral outline, not arched anteriorly. Snout produced and compressed. Palatine teeth in a single series. Ventrals joined by a membrane of considerable width between the internal rays. The height of the body is about one-thirteenth of its length; its thickness about one-twentieth. The tail does not appear to be in the least truncated, though so described by certain authors, one of whom in his figure shows a tail carried to an acute point, making the length of the body considerably greater in proportion to its height than is indicated in his own description. Color, yellowish, with silvery reflections; the limb of the operculum, the margin of the orbit, and the mouth darker.



Facsimile of figure of *Notacanthus Bonaparti* in Risso's MS.—From tracing by Professor Giglioli.

Radial formula: D. VI–VII; A. XII–100+; V. II, III–6 (IV–8 according to De Filippi and Verany).

This form was carefully figured and described by Risso in 1840. He had a single specimen, 148 millimeters long, which he recognized as an inhabitant of abyssal depths (*Sejour abymes marines vaseux*). By some error, his description and figure, otherwise perfectly consistent, disagreed in respect to the number of spines in the dorsal fin, the figure showing seven, the description nine. Misled by this, De Filippi and Verany redescribed the same fish in 1859, and to justify their course proposed the theory that Risso's description and figure were based on different specimens, a theory accepted without criticism by later writers, but which we can not believe a true one.

Risso was a careful and experienced worker, and it would be unjust to the memory of one of the best Italian ichthyologists to admit that he could be guilty of such an error. Then, too, he states positively that he had only a single specimen. It is much more probable that the German typesetter, in the office of *Wiegmann's Archiv*, mistook a "7" for a "9" in Risso's manuscript.

Risso's figure is a good one of a young *N. mediterraneus*, and his description agrees with it perfectly with the exception of this one figure in the text.

The specimen described and figured by Günther under the name *N. mediterraneus* is not a Mediterranean form, but one from the southern Pacific, and has been referred by us to a new genus and species. Moreau is in error in referring the figures of Bloch and of Cuvier and Valenciennes to this species (see discussion under *Notacanthus nasus*).

N. Bonapartii was described under the name *N. mediterraneus*, by De Filippi and Verany in 1857 from a specimen obtained at Nice, and preserved in the Zoölogical Museum at Turin. Two others from the same locality, referred by Moreau to this species, are in the Museum in Paris. The *Travailleur* and *Talisman* obtained four additional individuals: one from the coast of Soudan, at a depth of 1,232 meters, and another from the same region at 932 meters; two from the Banc D'Arguin at 1,195 meters. These last have been made the subject of an elaborate description by Vaillant, who also publishes a good figure.

This species is distinguished from *N. sexspinis* (Fig. 192 A, B), described by Richardson from Australian seas (Voyage *Erebus and Terror*, Fishes, 54, pl. XXXII, Figs. 4-11), and subsequently described by Günther, who also gives an excellent figure (Challenger Report XXII, 243, pl. LXI, Fig. *a*), by various characters, most striking of which is the difference in the relationships of the position of the dorsal spines and the soft anal fin. In *N. sexspinis* the dorsal and soft anal do not pass the same vertical, whereas in *N. mediterraneus* the last three dorsal spines are placed over the anterior part of the soft anal.

The type of *N. mediterraneus* from Nice was examined by Giglioli at the Turin Museum in 1882. Its total length is 203 millimeters, and its radial formula D. 6/1; A. 12/132?; V. 3–4, 8; C. 5?.

Prof. Giglioli informs us that in his "Central Collection of Italian Vertebrata" at Florence he has four specimens of *N. Bonapartii*, as follows:

a. Nice, August 11, 1882. Total length 153 millimeters. D 8/1; A. 6 7 120; V. 3 6 7; p. 9-10; C. 3–4?. A large, curved spine in upper corner of mouth on either side

b. Nice, March 7, 1891. Total length 265 millimeters. D. 7/1, A 11-120; V. 3 7; P. 12; C. 4?. Buccal spines hidden in skin.

c. Nice, June 15, 1892. Total length 203 millimeters. D. 7/1; A. 8?/140; V. 3/5 7; P. 10 12. Buccal spines large and prominent.

d. Syracuse, 1855–'60?. D. 7/1; A. 11 25; P. 9 10; V. 3/5.

Another specimen, collected by Bellotti at Messina, December 12, 1882, and now in the Museo Civico at Milan, was examined by Giglioli, who states that it was 104 millimeters long, and had D. 7/1; A. 7/?; V. 3/6; P. 10–12; C. 5?.

NOTACANTHUS PHASGANORUS, Goode. (Figure 186.)

Notacanthus phasganorus, GOODE, Proc. U. S. Nat. Mus., III., sig. 34, 535, Apr. 18, 1881.—GÜNTHER, Challenger Report, XXII, 249.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 900.—VAILLANT, Exp. Sci. Travailleur et Talisman, 318, *et seq.*

A *Notacanthus*, with its body a little higher over the ventrals than over pectorals, and comparatively elongated; with its lateral line slightly arched above the pectorals, sinking to median line of body in advance of first dorsal spines, and its last dorsal spine over the fifth from the last anal spine.

Its body is much compressed, it greatest width slightly more than one-third height of the body at vent. Scales round, thin, flexible, very small upon the head (not wider than the diameter of one of the dorsal spines) but upon the anterior half of the body about three times as large, decreasing in size upon posterior half, until upon tail they are smaller than upon head. Number of scales in lateral line not far from 400 (in the partially digested specimen before me it is impossible to make an exact enumeration). Number between lateral line and dorsal fin about 20, between lateral line and anal fin about 36. Head covered in every part, even the lips, with small scales, of which there are about 40 between eye and end of opercular flap. Scales deeply imbedded (in life probably hidden beneath a slimy epidermis).

Length of the head about 7⅓ times in that of body. The bones are flexible, and their outlines are invisible without dissection, the whole being covered with a leathery skin. Width of interorbital space appears to be (in the mutilated head) somewhat greater than length of snout, and about one-fourth length of the head. Diameter of orbit appears to be about one-half width of interorbital space. Length of postorbital portion of head nearly 3 times that of snout. Length of mandibular bone slightly exceeds twice diameter of eye; that of upper jaw considerably greater. Teeth in upper jaw blunt, accicular, set side by side like the teeth of a comb, about 32 on each side. In lower jaw shorter, slenderer, and in double rows. Villiform teeth upon palatines.

Dorsal fin begins at a distance from snout not far from 2¾ times length of the head, and nearly over the one hundred and tenth scale of lateral line; it consists of 10 low, widely separated spines, unconnected by any membrane. Distance between first and tenth spine nearly double length of head.

Spines from fourth to ninth about equidistant, while other interspaces are shorter.

Distance from snout to anal fin equal to about four times length of head. Anterior spinous portion of anal resembles dorsal and is devoid of connecting membrane. (The membrane is also absent from the posterior half of the fin, but may possibly have been destroyed. Anal rays extend to tip of tail and number about 130, the number of spines being 19. Anal begins immediately behind vent, and its length of base is slightly less than half that of body (less by a length about equal to the distance from the angle of the mouth to the gill-opening).

Pectoral fin placed at a distance behind the gill-opening about equal to width of its own base. (Its length is at least double this distance—how much more can not be determined, but the fin is evidently short and rounded in contour, the upper rays longest). Its base is stout, peduncular, and thickly covered with scales.

Distance of the ventrals from snout equal to that of the dorsal, though its insertion is slightly in advance of that of dorsal. Ventrals closely adjacent, separated by narrow groove, broad, with peduncle-like bases, thickly covered with scales and provided with two spines and eight or nine rays (as nearly as the specimen will permit determination).

Radial formula: D. X; A. XIX (130); C. 0; P. (17); V. II, 8-9.

Color, yellowish brown.

MEASUREMENTS.

	Millimeters.
Extreme length	968
Body:	
Height at vent	110
Greatest width	(40)
Head:	
Greatest length	132
Width of interorbital area	(34)
Length of snout	30
Length of postorbital portion (measured diagonally)	87
Length of upper jaw	40
Length of mandible	36
Diameter of orbit	17
Dorsal:	
Distance from snout	350
Length of base	215
Length of first spine	2
Length of last spine	7
Distance between first and second spines	7
Distance between second and third spines	19
Distance between third and fourth spines	22
Distance between fourth and fifth, fifth and sixth, sixth and seventh, seventh and eighth, and eighth and ninth spines	25
Distance between ninth and tenth spines	21
Anal:	
Distance from snout	437
Length of base	525
Length of first spine	2
Pectoral:	
Distance from snout	150
Length	(40)
Ventral:	
Distance from snout	350
Length	20+

The U. S. Fish Commission received the type from the schooner *Gatherer*, of Gloucester, Capt. Briggs Gilpatrick, which had been taken from the stomach of a Ground-shark, (*Somniosus brevipinnis*), on the Grand Bank of Newfoundland.

GIGLIOLIA, Goode and Bean, n. g.

A genus of *Notacanthidæ*, distinguished from *Notacanthus* by the less advanced position of the dorsal, the first dorsal spine being placed in the vertical over the vent and close to the vertical from the first anal spine. Dorsal spines 6-9; anal spines 15-18, these being longer and more slender than in *Notacanthus*, enveloped nearly to their tips in a membrane, and grading imperceptibly in length and size into those of the anal, which is comparatively high. The greatest height of the body is in the region of the ventral fins, and the lateral line, which is conspicuous, is arched over the pectorals and ventrals, but follows closely the dorsal outline until it passes beyond the dorsal spines, after which it is directed in a straight line to the tip of the pointed tail. Head comparatively broad, mouth inferior, almost suctorial, with lip absent in the middle portion of mouth in front; teeth in each intermaxillary 20-22; snout thick, swollen, much produced, nostrils large, conspicuous, covered by a membranous flap. Pectoral short, broad, rounded. Ventrals placed low down and completely united, extending to the vent.

In general appearance and proportions this form resembles the high backed division of the genus *Notacanthus*, to which belong *N. nasus* and *N. Chemnitzii*. Its mouth, however, is placed more on the under surface of the head than even in *N. sexspinis*.

This genus is named in honor of Commendatore Enrico Hillyer Giglioli, professor in the University of Florence, and founder of the Central Museum of Italian Vertebrates, who has been a leader in all the efforts of the Italian Government in deep sea research, and whose thorough works upon the geographical distribution of Italian vertebrates, both terrestrial and aquatic, are of an importance which can not be overvalued.

The only species assigned to this genus is that obtained by the *Challenger* off the southwest coast of South America, and referred by Günther to *Notacanthus Bonapartii*. This form, represented by a single individual 11½ inches long, from a depth of 400 fathoms at station 310, we propose to designate by the specific name *Moseleyi*, in memory of the late lamented Henry Nottidge Moseley, F. R. S., who was naturalist of the *Challenger*, and Linacre professor in the University of Oxford.

GIGLIOLIA MOSELEYI, Goode and Bean, n. s. (Figures 187, 188.)

Notacanthus Bonapartii, GÜNTHER, Challenger Report, XXII, 249, pl. LXI, Fig. C.

The following excellent description is that written by Dr. Günther:

Body moderately elongate, its greatest depth opposite the ventral fin and contained 2⅝ times in distance of the vent from the end of the snout; the length of the compressed oblong head is contained 2¼ times in the same length. The snout is thick, swollen, much produced beyond the narrow transverse mouth, which is opposite to the front margin of the orbit, and quite at the lower side of the head. Twenty teeth on each side of the upper jaw. The eye is close to the upper profile, two thirds of the length of the snout, one fifth of that of the head, and less than the width of the interorbital space. Gill-openings of moderate width, the gill-membranes being confluent in the vertical from the upper end of the gill-opening, and not attached to the isthmus.

The whole body and head are covered with minute, smooth, imbricate, and adherent scales.

All the dorsal spines are short, the anterior very short, the second opposite to the vent. The anal spines commence immediately behind the vent, and increase in length posteriorly, passing into the flexible rays, which are of varying and indefinite number. The pectoral is inserted at the usual distance from the gill-opening, and has a base of moderate width. Ventrals united and extending to the vent.

Radial formula: D. VIII-IX; A. XV-XVIII, 150+; C. 3; P. 9; V. I, 7; Cæc. pyl. 5.

POLYACANTHONOTUS, Bleeker.

Polyacanthonotus, BLEEKER, 1875.—GÜNTHER, Challenger Report, XXII, 1887, 243 (as subgenus).
Zanotacanthus, GILL, Johnsons' Cyclopædia, 1876, III, 883.
Paradoxichthys, GIGLIOLI, Nature, XXV, 535, 1882.
Teratichthys, GIGLIOLI, *loc. cit.*

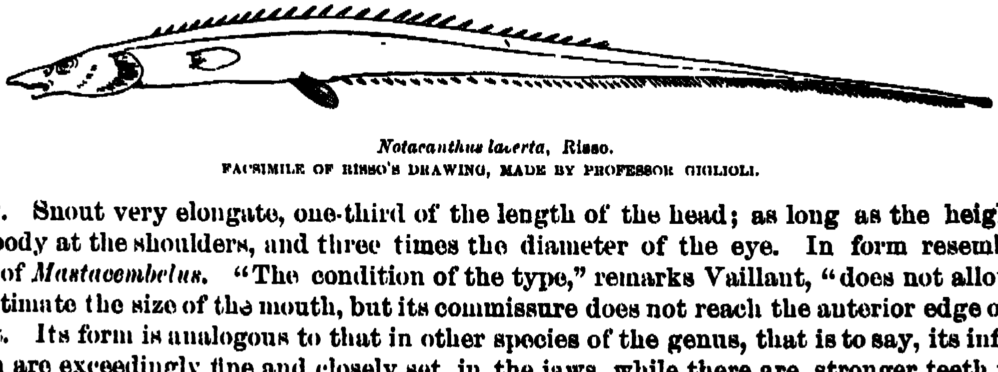
Notacanthids, with very slender, elongate body, and inferior mouth, and the snout prolonged into a proboscis-like tip, resembling that of *Mastacembelus;* its length at least one-third that of the head. Dorsal fin represented by numerous slender, curved, flexible, disjoined spines, the first of which is placed some distance behind the vertical from the origin of the pectoral. Anal composed of a smaller number of longer, slender, flexible spines, passing at a point some distance behind the last of the dorsal spines into a low, short, anal fin. Pectorals moderate, slender, placed above the median line of the body, and close to the lateral line. Ventrals slender, entirely separate, not reaching to the vent. Scales inconspicuous or probably absent. Lateral line conspicuous, descending from the angle of the operculum in a strong, broad curve to below the middle region of the body at a point not far from the vent. Teeth very fine, in rows upon each jaw; stronger teeth upon the palate, arranged in the form of a horseshoe. The ventral with one spine.

Type, *Notacanthus Rissoanus*, De Filippi and Verany.

POLYACANTHONOTUS RISSOANUS, (DE FILIPPI and VERANY), GÜNTHER. (Figures 188; 194 A, B.)

Notacanthus lacerta, RISSO, Unpublished Manuscript.
Notacanthus Rissoanus, DE FILIPPI and VERANY, Mem. Accad. Sci. Torino, XVIII, 1859, 187–99; Nota sopra alcuni Pesci del Mediterraneo, 1857, 3.—GÜNTHER, Cat. Fish. Brit. Mus., III, 545.—CANESTRINI, Pesci d'Italia, 118.—GIGLIOLI, Elenco, 31; Nature, XXV, 535.—MOREAU, Hist. Nat. Poiss. France, 162.—VAILLANT, Exp. Sci. Travailleur et Talisman, 385, pl. XXVII, fig. 1.
Notacanthus (Polyacanthonotus) rissoanus, GÜNTHER, Challenger Report, XXII, 250 (description and figure relate to another species).
Paradoxichthys Garibaldianus, GIGLIOLI, Nature, XXV, 535.

A Notacanthoid fish, slender and elongate in form, its greatest height, above the anus and near the middle of the body, one-fifteenth of the length of the body; its height at the shoulders about one-twentieth. The length of the head is about one-eighth of that of the body. Snout very elongate, one-third of the length of the head; as long as the height of the body at the shoulders, and three times the diameter of the eye. In form resembling that of *Mastacembelus*. "The condition of the type," remarks Vaillant, "does not allow us to estimate the size of the mouth, but its commissure does not reach the anterior edge of the orbit. Its form is analogous to that in other species of the genus, that is to say, its inferior teeth are exceedingly fine and closely set, in the jaws, while there are stronger teeth upon the palate, where they are arranged in the form of a horseshoe."



Notacanthus lacerta, Risso.
FACSIMILE OF RISSO'S DRAWING, MADE BY PROFESSOR GIGLIOLI.

Eye moderate in size, its diameter one-eighth the length of the head; interorbital space very narrow, not one-half the diameter of the eye. Branchial opening large. Operculum truncated posteriorly.

Vent in front of the middle of the body.

No traces of scales. The lateral line, however, is conspicuous, and it descends from the upper angle of the operculum to the middle of the body, or a little below it, in the vicinity of the region of the vent. The first dorsal spine is placed two-thirds times its own length back of the vertical from the axil of the pectoral, and its length is less than the diameter of the eye. The highest dorsal spines, those in the posterior third of the fin, are twice as long as the diameter of the eye. The spines are all slightly curved backward, and there is a soft, supplementary ray behind the last. The anal spines are longer than the dorsal spines, the longest two and one-half times the diameter of the eye. The first, which is somewhat longer than the first dorsal spine, situated behind the vent and under the eighteenth dorsal spine.

In the specimen figured and described by Vaillant there is a semblance of a minute, separate caudal fin, but it is by no means certain that this exists. The pectoral is placed a considerable distance from the operculum, nearly equal to the length of the snout, and its lower axil is in the median line of the body, or nearly so. Its length is about equal to that of the snout. The ventrals, situated at a distance from the snout equal to about one-third of the length of the body, do not reach the anus, and are the same size as the pectorals. In Vaillant's specimen they appear to be separate, and he was able to observe but a single spine. The color, in fresh condition, was milky white; the head and iris black.

Radial formula, D. 29–37; A. 34–41.

This species was known to Risso, who had in his collection the specimen which afterwards served De Filippi as a type and which is now in the Turin Museum. A sketch by Risso, of this fish, is here reproduced. The Turin specimen was examined by Prof. Giglioli in 1882: it is 160 millimeters long and has the following radial formula: D. 29/1; A. 35.

Prof. Giglioli has three specimens in his collection at Florence. We are indebted to him for the following details concerning them:

a. Nice, August 5, 1881 (type of *Paradoxichthys Garibaldianus*): Total length, 190 millimeters. D. 32/0; A. 38/100; P. 9–10; V. 1–10; C. 4?. *This specimen has a long, straight spine, pointed backwards, above the maxillary bone on either side.*

b. Nice, March 1, 1891: Total length, 186 millimeters. D. 30/1; A. 41/150; P. 10; V. 1/10 C. 4?. Found dead and partly decomposed. The peculiar maxillary spine is small in this and in the following specimen.

c. Nice, January 27, 1892: Total length, 160 millimeters D. 30/0; A. 34/?. Found partially digested in the stomach of *Galeus canis*.

In addition to these specimens, one other was taken by the French expedition off the coast of Morocco, station 40, at a depth of 2,212 meters. Its radial formula was D. 37/1; A. 27/?.

MACDONALDIA, Goode and Bean, n. g.

Notacanthids, with elongate body and inferior mouth. Body and head covered with minute, imbricated scales. Dorsal fin represented by numerous short, straight, robust and disjoined spines, 27 to 34 in number, the first in advance of the insertion of the pectoral. Anal as in *Notacanthus*, but lower, and with a longer portion of low, short, slightly curved, disjoined spines, from 35 to 55 in number, which under the final dorsal spines pass into flexible rays. Lateral line straight, conspicuous. Pectorals moderate, placed far back, below the middle line of the body, and remote from the lateral line. Teeth in jaws erect, small; and also in series on the vomer and palate. A line of pores on the inner edge of the mandible. Ventrals moderate, entirely separate.

This genus is named in honor of Col. Marshall MacDonald, U. S. Commissioner of Fisheries, in commemoration of his liberal policy in furthering ichthyological research.

MACDONALDIA ROSTRATA, (COLLETT), GOODE and BEAN. (Figures 189; 195 A, B.)

Notacanthus rostratus, COLLETT, Bull. Soc. Zool., France, 1889, 307.

The body is greatly compressed, its outlines tapering rapidly in both directions from the origin of the vent. Its greatest height is contained 3½ times in the distance of the vent from the tip of the snout, or about four-fifths the length of the head, which is contained 9½ times in the total. The snout is compressed, pointed, snake-like, produced beyond the mouth a distance less than the diameter of the eye and contained 3 times in the length of the head. The mouth is small; its cleft scarcely reaches to the anterior nostril. Each jaw is armed with a series of minute teeth and a similar series on vomer and palate. The eye is moderate in size, placed not far from the dorsal profile, distant about 2½ diameters from the end of the snout, more than 3 diameters from the end of the opercle. Gill opening wide.

The body and head covered by minute, imbricated scales. A line of mucous pores extends from the anterior end of the lateral line forward under the eye and to the end of the maxilla.

The dorsal spines are short, distant from one another, the first being over the end of the opercle, the fifth slightly behind the vertical through the origin of the pectoral, the twelfth slightly in advance of the origin of the pectoral, the fifteenth almost over the origin of the anal, and the last (twenty-eighth) a little behind the middle of the length of the tail. In another individual the fourth spine is immediately over the pectoral insertion, the thirteenth over the ventral origin, and the whole number of spines is 30, but there is behind the thirtieth a minute spine almost united by membrane. The anal begins immediately behind the vent and after the fifth spine the height of the fin remains uniform until the length of the rays gradually decreases near the tip of the tail. The pectoral is inserted at a distance from the gill opening nearly twice its own length. The ventrals have a broad base, are not confluent, and reach to the vent or slightly beyond it.

Radial formula:—D. XXVIII-XXXI; A. XLII-LIII.

The types are number 35601, U. S. N. M., and were obtained by the steamer *Albatross* at station 2216, N. lat. 39° 47′, W. lon. 70° 30′ 30″, in a depth of 963 fathoms. They measure 16½ and 16 inches, respectively. Another specimen, 17 inches long, was obtained by the same steamer at station 2553, N. lat. 39° 48′, W. lon. 70° 36′, in a depth of 551 fathoms. The *Hirondelle* took it off Newfoundland, in 1,267 meters.

Closely allied to *M. rostrata* is *Notacanthus challengeri* Vaillant (=*Notacanthus Rissoanus*, Günther, Challenger Report, XXII, 250, pl. LXI, Fig. B, not Filippi and Verany), renamed by Vaillant in the report of the *Travailleur* and *Talisman*, p. 387. This is distinguished by the larger number of its dorsal rays, the less anterior position of the origin of the dorsal, the lesser height of the body in comparison with the distance from the vent to the snout, comparatively longer snout and larger eye, and the absence of the suborbital row of mucous pores.

This form was obtained by the *Challenger* at station 237, south of Yeddo, in 1,875 fathoms.

Dr. Günther states that although this is a matter of some uncertainty, the diagnosis of *N. Rissoanus* "applies sufficiently well to his specimen;" further remarking that "since a number of Mediterranean fishes are identical with Japanese, and at least one other species of *Notacanthus* (*N. Bonapartii*) shows a wide geographical range, he should not feel justified in giving a distinct name to the fish described." We can not help feeling that Dr. Günther has departed from his customary cautious and scientific method in this case, and are satisfied that he would not have done so had he seen the specimen obtained by the French exploring expedition on the coast of Morocco, and described and figured by Vaillant. Coming, as it does, from the Mediterranean region, and having the proboscis-like character of the snout, much more emphasized than in the Japanese form, the presumptions in favor of its identity with *N. Rissoanus* are very strong. We therefore not only adopt the identification of Vaillant in preference to that of Günther, but accept the new name which Vaillant has proposed for the Japanese form.

Family LIPOGENYIDÆ.

Lipogenyidæ, GILL, MS.

Heteromes with a roundish, inferior, suctorial mouth; imperfect lower jaw with its rami separated at middle, connected with the corresponding sides of the upper jaw, and invested in a thick, transversely plicated, horseshoe-shaped lip, reflected upwards behind on the cheeks; no teeth; short row of 4 or 5 partially connected graduated dorsal spines and 5 to 7 branched rays, forming a regular fin. (*Gill.*)

The anomalous and unexampled modification of the lower jaw and mouth deserves a detailed anatomical examination, but the existence of only one specimen—for the present, at least—is deemed to render such an investigation inadvisable.

LIPOGENYS, Goode and Bean, n. g.

Head and body compressed, the body elongate, as in *Notacanthus*. Snout produced, compressed, obtuse at tip. Cleft of the mouth inferior, suctorial, circular in front, surrounded by rugose, contractile lip, with cleft posteriorly, flanked by wing like flaps, containing the modified mandibulary bones, which articulate with the end of the maxilla, and are free behind. A concealed spine at the end of the maxilla. No teeth. Anterior nostril in short tube, the posterior oblong, under a short flap. Dorsal fin short, but normal and well developed, with a distinct soft portion. Anal fin normal in position, high, with many spines, and with some of the rays spine like, though forked. A distinct, though very small, caudal fin. Ventrals normal, well developed, with several spines. Scales minute, very numerous. Lateral line conspicuous anteriorly.

LIPOGENYS GILLII, GOODE and BEAN, n. s. (Figures 190; 198 A, B.)

Body compressed, its greatest width one-half its height, which is about one-tenth of the length. The length of the head is contained 8⅔ times in that of the body and twice in the distance from the origin of the pectoral to the vent. The width of the interorbital space is about equal to the diameter of the eye, which is one-fifth the length of the head. The length of the snout is nearly one-fourth that of the head. The postorbital portion of the head is twice as long as the snout. The peculiar form of the jaws and mouth has been described under the head of the genus. The diameter of the circular opening is about one-half the diameter of the eye. The dorsal fin begins at a distance from the snout equal to about three times the length of the head. It consists of 5 graduated spines, of which the first is minute and the longest as long as the snout, and 5 rays, of which the second is longest, nearly one-half as long as the head. The spines and rays are all compactly arranged in a strong, triangular fin. The length of the dorsal base equals one half that of the head. The anal begins under the fourth spine of the dorsal; it contains 41 spines and 88 rays, of which the anterior ten are stiff, though articulated, and divided at the tip. The longest ray is longer than the longest spine, about as long as the snout. The ventral consists of 3 spines and 7 rays. The two fins almost meet in the median line, but are disconnected. The fin reaches to the vent. Its distance from the tip of the snout is about 2½ times the length of the head. The pectoral is placed below the median line of the body, at a distance from the head about equal to the diameter of the eye; its length is a little greater than the postorbital part of the head. The lateral line is well developed anteriorly, becoming obsolete at a distance from the end of the dorsal about equal to 2½ times the length of the head.

The color is uniform light brown. The under side of the gill covers dark, showing dark at the edges of the opercular bone.

The type measures 17 inches in length. It is No. 39212, and was taken by the steamer *Albatross* at station 2742, in N. lat. 37° 46′ 30″, W. long. 73° 56′ 30″, from a depth of 865 fathoms.

Order TELEOCEPHALI.

Teleocephali, GILL, Johnson's Cyclopædia, IV, 763, 1877.

Skeleton more or less ossified; skull well developed, and its elements numerous, with cranial bones as follows: Of cartilage bones, basioccipital, exoccipital, supraoccipital, basisphenoid, alisphenoid, opisthotic, prootic, postfrontal, and prefrontal; of membrane bones, parietals, frontals, nasals, vomer, parasphenoid, superorbitals, intermaxillaries, and supermaxillaries; the suspensory arch of the lower jaw has a well developed quadrate bone, with which, on the one hand, is articulated the pterygo-palatine arch, consisting, generally, of the ectopterygoid, entopterygoid, mesopterygoid, and palatine bones, and, on the other, the hyomandibular and symplectic; the branchihyal apparatus consists of a median series of bones (glossohyal, basihyal, ceratohyal, epihyal, and stylohyal), with the posterior of which are connected four branchial arches and a modified pharyngeal, and with the anterior of the branchiostegal arches, bearing, generally, 3 or more (most generally 6 or 7) rays on each side; the lower jaw is composed of a dentary, and, behind, of an articular, angular, and surangular; the scapular arch has an undivided proscapula (to the inner side of which are apposed at least a hypercoracoid and hypocoracoid), and is connected with the cranium by postero-temporal and post-temporal bones; the brain is differentiated, according to the current nomenclature, into (1) a cerebral part, consisting of cerebral hemispheres and optic lobes, and, in front, small, olfactory lobes; and (2) a cerebellar part, cerebellum, which is moderately developed, covered, and simple. (*Gill.*)

Family BERYCIDÆ.

Berycidæ, LOWE, Proc. Zoöl. Soc., London, 1839, 76; Hist. Fishes of Madeira, p. 48, 1843 (also p. VIII).—GÜNTHER, Cat. Fish. Brit. Mus., I, 1859, 8.

Berycidæ, GILL, Arrangement, Families of Fishes, 1872, 10 (No. 161) (=Günther's *Berycidæ*, genera V–IX, *loc. cit.*, pp. 12–50).—JORDAN & GILBERT, Bull. 16, U. S. Nat. Mus., p. 457.

Holocentroidei, BLEEKER, Tentamen, 1859, XIX (in part).

Body oblong or ovate, compressed, with scales ctenoid, cycloid, foliate, or granular. Head large and thick, not exceedingly cavernous. Mouth wide, oblique. Eye lateral and large. Maxillaries large, premaxillaries protractile; suborbitals narrow. Teeth villiform, in one or more bands, sometimes with a few pairs of fangs, as in *Caulolepis*. Opercular bones usually spinous, and the other bones of the head usually strongly serrated. Branchiostegals VII–VIII; gill membranes separate, 3; gills 4, a slit behind the fourth; pseudobranchiæ present; gill-rakers moderate. A single dorsal; anal with but few spinous rays; ventral fins thoracic, with 6 or more soft rays; pyloric cæca numerous.

This family is characteristically bathybial, few members being known to occur in shallow waters, and, indeed, with the exception of the family *Holocentridæ*, the whole of the superfamily *Berycoidea* as proposed by Gill, including the families *Berycidæ* (except two species of *Beryx*), *Trachichthyidæ*, *Stephanoberycidæ*, and *Anomalopidæ*, are found at very considerable depths. *Monocentridæ*, known from Chinese and Japanese seas, are probably also inhabitants of the region below 100 fathoms. As Günther has shown, this group are found only in the sea, and are provided with highly developed apparatus for the secretion of superficial mucus, thus fitting them for living at a greater depth than any other allied group. "They have," wrote Günther, "a world-wide distribution in all tropical seas." In this connection the geological history of this group is particularly significant. "Fossil Berycoids," says Günther, "show a still greater diversity of form than living; they belong to the oldest Teleosteous fishes, the majority of Acanthopterygians found in the chalk being representatives of this family. *Beryx* has been found in several species, with other genera now extinct: *Pseudoberyx*, with abdominal ventrals, from Mount Lebanon; *Berycopsis*, with cycloid scales; *Homonotus*, *Stenostoma*, *Sphenocephalus*, *Acanus*, *Hoplopteryx*, *Platycormus*, with granular scales; *Podocys*, with a dorsal fin extending to the neck; *Acrogaster*, *Macrolepis*, and *Rhacolepis*, from the chalk of Brazil. Species of *Holocentrum* and *Myripristis* occur in the Monte Bolca formation."

KEY TO THE SUBFAMILIES AND GENERA OF BERYCIDÆ.

I. Scales ctenoid. Teeth villiform on jaws, palatines and vomer.......................... *Berycinæ*
A. Muzzle short; chin projecting.
1. Preoperculum spineless; opercular bones serrated.
a. Anal spines, 4; ventral rays, 7 or more.......................... BERYX
II. Scales cycloid; teeth villiform on jaws, palate toothless; head large and thick; cleft of mouth wide, oblique, ventrals I, 10.......................... *Melamphainæ*
A. Teeth in bands. Scales large.
1. Anal far behind dorsal.
a. Anal with 2 spines and 6 rays; dorsal with 6 spines; ventral with 7 rays. Teeth in single rows.......................... MELAMPHAES
2. Anal origin under posterior end of dorsal.
a. Eye moderate. Anal with 1 spine and 8 to 9 rays; dorsal with 3 spines; ventrals with 7 rays. Teeth sometimes in double rows.......................... PLECTROMUS

b. Eye minute, rudimentary. Dorsal and anal short (number of spines not known); ventrals with 10 rays. Teeth in single bands in jaws.......................................SCOPELOGADUS
B. Teeth in single, villiform bands in each jaw; palate toothless; scales moderate, exceedingly thin, deciduous. Mouth wide. Lateral canal distended. Caudal emarginate, with basal folds. Ventrals, 5.......................................MALACOSARCUS
C. Teeth small, cardiform, in the upper jaw present only in the short premaxillary; lower jaw projecting.
1. Scales thin; body short, compressed, scopeliform; ventral rays, 7–8.......................POROMITRA
III. Scales minute, irregular; teeth irregular, palatines toothless; mouth very wide and oblique. *Anoplogastrinæ*
A. Scales reduced to minute asperities; teeth villiform in the jaws, with several somewhat larger in the lower jaw.......................................ANOPLOGASTER
B. Scales small, leaf like, pedunculated; teeth villiform, with two pairs of long, fang-like teeth above and three below.......................................CAULOLEPIS

BERYX, Cuvier.

Beryx, Cuvier, Règne Animal, 1829, II, 151 (type, *B. decadactylus*).—Cuvier & Valenciennes, Hist. Nat. Poiss. III, 226.—Günther, Cat. Fish. Brit. Mus., I, 12.—Lowe, Hist. Fishes of Madeira, 48.

Body oblong, compressed; abdomen trenchant, not carinated. Scales ctenoid, arranged regularly. Head large, angular, with thin bones, and large, but not conspicuous, muciferous cavities. Eye very large; mouth wide, oblique; teeth villiform in jaws, and on vomer and palatines. Branchiostegals, VII–X. Gill openings broad. Preoperculum spineless. A single dorsal fin, its anterior portion composed of a few inconspicuous spines. Anal spines, IV; ventral rays seven or more. Caudal deeply forked, with an anterior group of spinous rudimentary rays above and below. Air-bladder simple. Pyloric cœca, 20–30.

Of this genus four species are known in addition to the immature *Beryx delphini* described by Cuvier and Valenciennes[*] from a specimen taken out of the stomach of a dolphin in the Western Indian Ocean (lat. 22 S., long. 51 E.), which seems most closely related to *B. decadactylus*. *B. lineatus* and *B. affinis* of Günther belong to the Australian fauna, and are said to occur in water of no very considerable depth. The other forms range to a depth of 400 fathoms or more, but the young of one them at least occurs about Madeira not far below the 100-fathom line.

BERYX DECADACTYLUS, Cuvier and Valenciennes.

Beryx decadactylus, Cuvier & Valenciennes, Hist. Nat. Poiss., III, p. 222.—Lowe, Trans. Zoöl. Soc. London, III, 1.—Webb and Berthelot, Ichth. des Iles Canaries, XIII, 1836, pl. IV.—Günther, Cat. Fish. Brit. Mus., I, 16; Challenger Report, XXII, 33.—Steindachner, Denkschr. d. k. Akad. d. Wiss. Wien, XLVII, 220.

Beryx borealis, Düben and Koren, Kon. Svensk. Vetensk. Akad. Handl., 1844, p. 33, pl. II.—Collett, Vid. Selsk. Forh., Christiania, 1884, I, pl. I.—Lilljeborg, Sverig. och Norg. Fisk., 76.

Body oblong, considerably compressed, its height greatest at the origin of the dorsal; contained 2½ times in its length, and equal to the length of the head. The upper maxillary bone reaches almost to the middle of the orbit. The eye is very large, its diameter about 2½ times in the distance from the tip of the snout to the extremity of the operculum, its upper limb impinging upon the upper profile of the head. The distance of the insertion of the pectoral from the snout is equal to the length of the base of the anal. The insertion of the anal is approximately in the vertical from the tenth to the twelfth dorsal ray, and its middle is slightly behind the ultimate ray of the dorsal. The ventral is inserted under the axil of the pectoral. The scales are sharply ctenoid, with a strong middle keel; the number in the lateral line is 64 to 65, and there are said to be from 34 to 35 in the transverse row, although the published figures indicate about 18 below the lateral line, and perhaps half the number above.

Radial formula: D. IV, 16–19; A. IV, 28–29; V. 1–10; P. 14 (?).

This species was first described by Cuvier from a dried specimen in the Museum at Lisbon, which at the time was supposed to have come from Madeira, but which is more likely to have been from the coast of Portugal, since Capello finds it not infrequent in the markets of Lisbon from January to April, where it is known as the *Imperador*. It was afterwards found at Madeira by Lowe, who, unaware of the existence of two species in those waters, figured it in the Cambridge Transactions under the name of *B. splendens*, and it has since been found to be almost as abundant about Madeira as Lowe's subsequently described species. It is known by the Madeiran fishermen as the *Alfonsin á casta larga*, and it is more brilliantly scarlet, though it has a paler mouth. It is obtained at a depth of from 300 to 400 fathoms, at from 1 to 2 leagues from the shore, and attains the weight of 4 or 5 pounds. The *Challenger* obtained specimens from the Sea of Japan at a depth of 345 fathoms. Dr. Döderlein also obtained specimens in Japan in 1881.

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[*] Hist. Nat. Poiss. IX, 454; Règne Animal, III, pl. XIV, Fig. 3.

The type of *B. borealis* was taken at Börnæs, near Bergen, March 8, 1839. Two additional examples, referred to this species, were secured near Bergen in 1871; these are mentioned in "Norges Fiskø," 1874, and again by Lilljeborg in his "Skandinavisk Fauna" in 1881. Lilljeborg admitted it as a species doubtfully distinct from *B. decadactylus*.

Collett has compared the type of *B. borealis* with an adult specimen of *B. decadactylus* from Madeira and with Steindachner's descriptions of examples of this species from Lisbon and the Canaries and those taken by Döderlein in Japan. The type of *B. borealis* is only 280 millimeters long, and Collett is satisfied of its identity with *B. decadactylus*. He has critically studied the chief diagnostic characters relied upon by Düben and Koren, namely, the greater height of the body and the number and size of the nasal spines.

We present below a translation of the essential parts of his discussion:

> Lowe, in 1840, and Steindachner, in 1877, showed that the character stated by Cuv. & Val. (copied by Günther) of the body height in *B. decadactylus* equaling the length of head, is erroneous. In this species the length of the head is always less than height of body, and is contained in it from 1⅓ to 1½ times. In the Museum example from Madeira the proportion between the head length and body height is as 1 to 1.33; in the type of *B. borealis*, which is only one-half as long as the Madeira specimen, and thus should have a relatively greater height of body, the proportion is as 1 to 1.43. No specific difference can be based on this character.

The number and size of the spines of the snout he found to vary with the size and age of the fish, and he concludes that this character is unimportant. In Japanese examples of *B. decadactylus*, measuring 370 millimeters, the preorbital spine is one-third as long as the eye, almost exactly as in the typical specimen of *B. borealis*. The relative length of this spine decreases with age.

In the radial formula and number of scales, *B. borealis* and *B. decadactylus* agree. There is no difference in their proportions, dentition, and other specific characters.

BERYX SPLENDENS, Lowe. (Figure 197.)

Beryx splendens, Lowe, Proc. Zoöl. Soc. London, 1833, 142; Cambridge Phil. Trans., VI, 197 (the figure represents *B. decadactylus*); Fishes of Madeira, 47, pl. VIII.—Günther, Ann. and Mag. Nat. Hist., 1878, I, 485; Challenger Report XXII, 33.—Hilgendorf, Sitzungsber. Gesellsch. Naturf. Freunde, Berlin, 1879, 78.—Steindachner, *loc. cit.*, 221.

Body compressed, elongate, its height equal to the length of the head, and contained 3½ times in the total. The pectoral and dorsal fins, which are equal in length, are one-fifth of the entire length of the fish; the ventral, one-sixth. The dorsal and anal fins are higher than in *B. decadactylus*, and the insertion of the anal is under the end of the dorsal. Caudal deeply forked. Scales large, the whole surface spinous, with short reflexed points or prickles, giving a general roughness to the touch. Lateral line nearly straight, following the curvature of the back, inconspicuous, and with 71 to 76 scales, with 8 above and 20 be-below the lateral line in transverse series. Its color is thus described by Lowe: "At the moment of capture, whilst this fish is yet alive, the whole body beneath the lateral line is of a pure, resplendent, silvery white; the fins alone, and merely the ridge of the back and head, the inside of the mouth, the lower jaw, and parts beneath the eye, being of the brightest scarlet, contrasting strongly with the pure silver of the whole sides and belly, which only after death turn iridescent-rosy, or sometimes rich golden scarlet. The hind parts of the dorsal and the ventral fins are transparent; the iris is pale scarlet. There is a watery transparency about the scarlet of the back in this state perfectly inimitable by art.

"The fishermen affirm correctly that this superior degree of whiteness when first captured is constant in this species, their *Alfonsin á casta cumprida*, as compared with *B. decadactylus*, Cuv., their *Alfonsin á casta larga*, which is from the first more generally scarlet or high colored. It is also remarkable that the pale-colored mouth is characteristic of the outwardly richer colored species; while in the paler, *B. splendens*, the mouth internally is full bright red."

Radial formula: D. IV, 13–15. A. IV, 25–29. V. I, 7 +.

This species, originally described by Lowe in 1833, was, as has already been stated, erroneously represented in the Cambridge Philosophical Transactions, by a figure of the other species. In Madeiran waters it is equally abundant with *B. decadactylus*, but it has not been identified from the Lusitanian coast. A single specimen was obtained by the steamer *Albatross* at a depth of 424 fathoms from station 2415, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., and the British Museum has lately secured specimens from Japan.

Lowe records the following singular observations: "One singular distinction which exists between this fish and *B. decadactylus*, Cuv., is the comparatively rapid decomposition of the viscera. I have repeatedly had individuals of both sorts brought for examination, which had been caught together, and while the whole contents of the abdomen in *B. decadactylus* have been in the most perfect preservation, those of *B. splendens*, though in other respects the fishes were quite fresh, have proved entirely decomposed. And I have only been able to overcome this difficulty by going out in the fishing boats and being present at the actual capture of this latter species, the *Alfonsin á casta cumprida* of the fishermen; which begins to be met with of small size at the depth of 150 or 200 fathoms, but is scarcely taken in full size and plenty except with its congener, *B. decadactylus*, Cuv., the *Alfonsin á casta larga*, at the enormous depth of from 300 to 400 fathoms, and from 1 to 2 leagues from the shore."

MELAMPHAES, Günther

Metopias, LOWE, Proc. Zoöl. Soc. London, 1843, 90 (type, *M. typhlops*). (Name preoccupied by a genus of Coleoptera.)
Melamphaes, GÜNTHER, Cat. Fish. Brit. Mus., V, 433; Challenger Report, XXII, 26

Berycine fishes, with a large and thick head, the superficial bones of which are largely modified by the presence of wide, muciferous channels. Cleft of mouth large, very oblique; lower jaw slightly protruding. Teeth villiform, in a single narrow band in each jaw; palatine toothless. Scales large, cycloid, somewhat irregular. A single dorsal with six spines and eleven rays (in type species). Vent far behind the end of the dorsal, and the anal fin occupying a space midway between the vertical from the end of the dorsal and the origin of the caudal, having two spines and six rays. Branchiostegals, VIII; pseudobranchiæ present. Opercles not armed.

MELAMPHAES TYPHLOPS, (LOWE), GÜNTHER. (Figure 198.)

Metopias typhlops, LOWE, Proc. Zoöl. Soc. London, 1843, 90; 1850, p. 251.
Melamphaes typhlops, GÜNTHER, Cat. Fish. Brit. Mus. V, 433; Challenger Report, XXII, 27, pl. V, fig. K.

The greatest depth of the body below the origin of the dorsal fin equals the depth below the occiput, and is rather more than one-fourth of the total length (without caudal), the length of the head being one-third. The head is but little compressed, but higher than broad, and longer than high; the snout is very obtuse, with the lower jaw scarcely projecting beyond the upper; maxillary extending to behind the vertical from the posterior margin of the eye; eye small, its diameter being one-sixth of the length of the head, and two-thirds of that of the snout; crown of the head very convex, divided by ridges (which are angularly bent) into a central rhomboid portion and into a pair of lateral ones; the skin, extending from ridge to ridge and covering the muciferous channels, is finely and longitudinally plaited, and pierced at regular intervals by very small pores. The operculum has a membranaceous margin; the gill membrane perfectly free from the isthmus, and not united with that of the other side; there are four perfect gills, but the pseudobranchiæ are small. Head entirely scaleless.

The distance between the origin of the dorsal fin and the end of the snout is nearly equal to that between the dorsal and caudal fins; its spines are very feeble, gradually increasing in length behind, the second soft ray being the longest, but much shorter than the base of the fin. The anal fin is small, with the spines very feeble; and there are not more than two in the specimen from which this description is taken, while Mr. Lowe says that he has found four spines in the first specimen which was discovered. The base of the anal fin is covered with rather large scales. Caudal fin small, forked, covered with scales at the base; pectoral falciform, not quite as long as the head, and not extending on to the vent; ventrals much shorter, with the spine very feeble. The scales are large, especially on the trunk, with the margin irregularly notched; they become smaller on the tail, but the thoracic region is covered with very large ones, especially one between the ventrals, being not much smaller than the operculum. Lateral line none. Color, entirely black. (*Günther.*)

Radial formula: D. VI, 11; A. II, 6; V. I, 7; lat. line 25; transverse line 7.

Known only from Madeira. Lowe's type is said to be lost.

PLECTROMUS, Gill.

Plectromus, GILL, Proc. U. S. Nat. Mus. VI, 1883, 257, 258.—BEAN, *op. cit.*, 1885, 73.—JORDAN, Cat. Fish. N. A., 1885, 74.

Berycine fishes, resembling in form *Melamphaes*, with moderate cycloid scales. Head large and thick, with wide muciferous channels, and often with conspicuous foliaceous continuations of the superficial bones. Cleft of mouth moderate, somewhat oblique. Jaws nearly equal, though the under one is slightly the more prominent. Teeth villiform in the jaws (in the type species, *P. suborbitalis*), arranged in two rows, of which those of the inner row, at least in the lower jaw, are largest; palatines toothless. A single dorsal, with 2 to 3 spines and 10 to 16 rays. Vent and origin of the anal under the last rays of the dorsal, the anal fin with 1 spine and 8 to 9 rays. Ventrals thoracic, and with 7 rays as in *Melamphaes*. Branchiostegals VIII; pseudobranchiæ present; opercles not armed. Caudal forked.

The genus *Plectromus*, which has been united with *Melamphaes* by European ichthyologists, is provisionally maintained in this work on account of certain apparently valid characters, such as the more normal position of the anal fin, which is inserted under the end of the dorsal rather than far back as in the typical *Melamphaes*; also by the much smaller number of spines in the dorsal and the larger number of rays in the anal, which appears also to have 1 instead of 2 antecedent spines.

Most of the Atlantic species described by Günther appear to be more closely allied to the *Plectromus* type than to *Melamphaes typhlops*, and are provisionally placed in the genus *Plectromus* rather for the purpose of eliciting further discussion than as an expression of positive opinion, for which the material at our disposal is not sufficient. *Melamphaes crassiceps*, Günther (of which a figure is given), appears, however, to be a very close ally of the species described by Bean under the same specific name.

In addition to the several Atlantic species, *M. myzolepis*, Günther (Ann. and Mag. Nat. Hist., 1878, II, 185, Chall. Report, XXII, 28), obtained by the *Challenger* south of New Guinea and off the Arroe Islands at 800 fathoms, and by the *Investigator* in the Bay of Bengal at 1,310 fathoms (*Alcock*, Ann. and Mag. Nat. Hist., Sept., 1890, 201), seems to have affinities with *Plectromus*.

The following details concerning the genus *Plectromus*, as represented in the type species, *P. suborbitalis*, are furnished by Dr. Gill:

Body little compressed, highest behind ventrals, with the dorsal outline describing a slight sigmoidal curve and the abdominal almost rectilinear; the caudal peduncle long and robust.

Scales moderate, imbricated, cycloid, and readily deciduous.

Lateral line apparently undeveloped.

Head oblong or longer than high, very declivous in front, and with the suspensorium almost vertical; the cranium above with a naked skin extending from the nape forward to the nasal region covering large muciferous cavities separated by osseous bars and with lateral crests simulating those of crested Scorpænids.

Suborbital bones with the superficial area narrow and emitting sulcate spiniform processes; cheeks covered with skin as well as periorbital region.

Preoperculum with its inner fold parallel with but widely separated from the external margin; the latter is rounded at the angle, the posterior limb is vertical, and a short horizontal one is developed.

Operculum normally developed, with large cycloid scales, and, behind, radiating ridges; suboperculum extending as a membranous border behind; interoperculum moderate.

Eye moderate (its diameter equaling a quarter of the head's length) and entirely in the anterior half of the head.

Mouth with the cleft moderately oblique.

Upper jaw not protractile; the intermaxillaries protracted backwards almost as far as the supermaxillaries; the latter have normally dilated smooth ends.

Lower jaw quite deep, curved, with smooth skin, with the rami inclined inwards below and nearly contiguous, and with a truncate chin.

Teeth rather small, curved, and pointed, in two rows in each jaw, those of the upper closing around the lower jaw, and the teeth of the external row (at least in the lower jaw) smaller than those of the internal.

Branchial apertures normally cleft.

Shoulder girdle emitting a spine on each side, behind the nape.

PLECTROMUS SUBORBITALIS, GILL. (Figure 201.)

Plectromus suborbitalis, GILL, Proc. U. S. Nat. Mus., VI, 1883, 254-7-8.—JORDAN, Cat. Fish. N. Amer., 1885, 74.

A species of *Plectromus* having the length of the head contained nearly 3 times in the total without the caudal; the height of the body 3⅜ times. The diameter of the eye equals the length of the snout and is contained 5½ times in the length of the head. Mouth oblique; the end of the maxilla reaches to below the hind margin of the orbit. Two spines, one on each side of the nape, springing forward from the shoulder bones, give a strange appearance to the fish, and have gained for it the generic name *Plectromus*. The mandible projects slightly. Gill membranes deeply cleft, free from the isthmus behind, gill rakers moderate, about 15 below angle of 1st arch. A single series of weak, somewhat scattered, curved teeth on the intermaxilla and mandible.

The dorsal origin is over about the sixth row of scales; the length of the dorsal base equals length of head. The anal origin is under the seventeenth ray of the dorsal; the anal base is nearly one-third as long as the head.

The pectoral is two-sevenths of the total length without the caudal. Theven tral originates under the base of the pectoral; these fins are imperfect.

Radial formula: D. III, 16; A. I, 8; P. 14; V. I, 7. Scales about 30; transverse series, 6; the exposed margins of the few scales present are marked with coarse concentric striæ.

Color, black.

The type of the species (No. 33271, U. S. N. M.), 3$\frac{9}{16}$ inches long without the caudal, which is imperfect, was obtained by the *Albatross* from station 2036 in 38° 52′ 40″ N. lat., 69° 24′ 40″ W. lon., at a depth of 1,735 fathoms. Another (No. 35451, U. S. N. M.) was taken from station 2190, in 39° 40′ N. lat., 70° 20′ 15″ W. lon., at a depth of 1,800 fathoms; also two small individuals from station 2535, in 40° 03′ 30″ N. lat., 67° 27′ 15″ W. lon., at a depth of 1,149 fathoms.

PLECTROMUS BEANII, (GÜNTHER), GOODE and BEAN. (Figure 202.)

Plectromus crassiceps, BEAN, Proc. U. S. Nat. Mus., 1885, 73 (preoccupied).—JORDAN, Cat. Fishes N. A., 1885, 74.
Melamphaes Beanii, GÜNTHER, Challenger Report, XXII, 1887, 29.

Height of body two-sevenths of total length (without caudal); length of head one-third. Diameter of the eye contained 4½ times in the length of the head. The maxillary extends to or slightly beyond the vertical through the hind margin of the eye. The pectoral is equal in length to the head, and more than twice as long as the ventral, and its tip does not extend quite to the vent. The scales are large, there being about 25 rows in the longitudinal series.

Radial formula: D. II, 11-12; A. I, 8-9; V. I, 8; P. 15.

Color, nearly black; the fins somewhat lighter at the margins.

The type specimen (Cat. No. 33553, U. S. N. M.) was obtained by the *Albatross* from station 2099, in 37° 12′ 20″ N. lat., 69° 39′ W. lon., at a depth of 2,949 fathoms, and is consequently remarkable as coming from the greatest depth explored by the *Albatross*, and the greatest depth from which any fish has ever been obtained. Its length is 48 millimeters, and it is very badly preserved. Other specimens were obtained by the *Albatross* as follows: Cat. No. 33378, U. S. N. M., from station 2075, in 41° 40′ 30″ N. lat., 65° 35′ W. lon., at a depth of 855 fathoms; Cat. No. 33509, U. S. N. M., from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1022 fathoms; Cat. No. 34835, U. S. N. M., from station 2106, in 37° 41′ 20″ N. lat., 73° 03′ 20″ W. lon., at a depth of 1,497 fathoms; Cat. No. 35609, U. S. N. M., from station 2209, in 39° 34′ 45″ N. lat., 71° 31′ 30″ W. lon., at a depth of 1,080 fathoms; Cat. No. 35522 U. S. N. M., from station 2215, in 39° 49′ 15″ N. lat., 20° 31′ 45″ W. lon., at a depth of 578 fathoms; Cat. No. 35412, U. S. N. M., from station 2182, in 39° 25′ 30″ N. lat., 71° 44′ W. lon., at a depth of 861 fathoms; Cat. No. 35533, U. S. N. M., from station 2208, in 39° 33′ N. lat., 71° 16′ 15″ W. lon., at a depth of 1,178 fathoms; and from station 2428, in 42° 48′ N. lat., 50° 55′ 30″ W. lon., at a depth of 826 fathoms; station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms; station 2572, in 40° 29′ N. lat., 66° 04′ W. lon., at a depth of 1,769 fathoms.

PLECTROMUS ROBUSTUS, (GÜNTHER), GOODE and BEAN.

Melamphaes robustus, GÜNTHER, *Challenger* Report, XXII, 1887, 29.

The height of the body is two-sevenths of the total length (without caudal); the length of the head a little less than two-fifths; the least depth of the tail is two-fifths of its free portion. Head thick, with the usual muciferous cavities; snout short; eye very small, about one-eighth of the length of the head and one-half of that of the snout. Posterior margin of the preoperculum subvertical; lower jaw slightly prominent; cleft of the mouth rather oblique, wide, extending beyond the eye. Maxillary dilated behind. Origin of the dorsal fin midway between the end of the snout and the root of the caudal, somewhat behind the base of the ventrals, which are distinctly thoracic. The last dorsal ray is opposite to the first of the anal. Upper pectoral rays elongate and reaching to the vent; ventrals rather short.

Radial formula: D. II (?), 11; A. I, 9; V. I, 7; L. lat. 33.

Color, uniform black.

TABLE OF MEASUREMENTS.

	Millimeters.
Total length	53
Depth of the body	12¼
Length of the head	17
Diameter of the orbit	2
Length of the caudal fin	8

The *Challenger* obtained several specimens of this species, one from the mid-Atlantic, southwest of Sierra Leone, station 106, at a depth of 1,850 fathoms; another from midway between the Cape of Good Hope and Kerguelen Island, station 146, at a depth of 1,375 fathoms; and another north of New Guinea, station 220, at a depth of 1,100 fathoms. The New Guinea specimen is 2¾ inches long; the one from station 146, 6¾ inches.

PLECTROMUS CRASSICEPS, (GÜNTHER), GOODE and BEAN. (Figure 200*a*.)

Scopelus crassiceps, GÜNTHER, Ann. and Mag., Nat. Hist., II, 1878, 185.
Melamphaes crassiceps, GÜNTHER, Challenger Report, XXII, 28, pl. VIII, fig. B.

The height of the body is one-fourth of the total length (without caudal); the length of the head, one-third; the least depth of the tail is two-fifths of its free portion. Head very thick with short snout. Eyes, small, one-seventh of the length of the head, and one-half of that of the snout; posterior margin of the preoperculum descending obliquely backwards; lower jaw slightly prominent; cleft of the mouth rather oblique; the maxillary reaches to behind the eye, and is moderately dilated behind. Origin of the dorsal fin nearer to the extremity of the snout than to the caudal fin, and immediately behind the base of the ventrals; its last ray is above the anterior anal rays. Pectoral fin narrow, nearly as long as the head, reaching to or beyond the end of the anal fin. Black. (*Günther.*)

Radial formula: D. III, 12; A. I, 8–9; P. 14; V. I, 7; L. lat. 28.

The *Challenger* obtained one specimen, 2 inches long, from the mid-Atlantic (station 107) at a depth of 1,500 fathoms; another, 2½ inches long, off Pernambuco, station 120, at a depth of 675 fathoms.

PLECTROMUS MEGALOPS, LÜTKEN.

Melamphaes megalops, LÜTKEN, Oversigt. K. D. Vid. Selsk, Forhandl., 1877, 176, pl. v, figs. 1–3.—GÜNTHER, Challenger Report XXII, 27, pl. v, fig. 3.

Height of the body one-fourth of the total length, and not quite equal to the length of the head. Eye rather large, its diameter more than one-fourth the length of the head, and considerably greater than that of the snout. Interorbital space in its greatest width equal to about half the greatest height of the body; in its least width, one-fourth the greatest height of the body. The caudal peduncle is long and slender, its length equal to the distance from the posterior root of the anal to the head; its height, immediately behind the dorsal and anal fins, is equal to one-half the greatest height of the body; its least height, about midway between the dorsal fin and the caudal, scarcely more than one fourth of the height of the body. The anal is inserted under the last rays of the dorsal, broadly triangular in form, and owing to the rapid diminution in the height of the body under the dorsal and anal, both of these fins present the greater portion of their upper margin toward the posterior portion of the fish. The pectorals are long, leaf-like, extending beyond the roots of the dorsal and anal. The ventral is placed entirely in advance of the root of the pectoral, and is very broad and stout—almost spatulate at its extremity; its length equal to that of the pectoral, and its tip overlapping the anterior portion of the anal. The head is very rough, foliaceous; lower jaw prominent and projecting. Color, black.

D. III, 11; A. I, 9; P. 10–11; V. I, 7; L. lat. 34; L. trans. 9; B. 8.

This species was described by Lütken from the Atlantic, south of the Azores. Its proportions are so peculiar that it seems quite possible that it may not belong either to *Melamphaes* or *Plectromus*, as now characterized.

SCOPELOGADUS, Vaillant.

Scopelogadus, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 140.

Melamphaes, VAILLANT, *loc. cit.*, 385. (part).

Berycine fishes resembling *Melamphaes* and *Plectromus*, but in general form strongly suggestive of *Myctophum*. Scales moderate and cycloid, regularly arranged. Head thick and comparatively short, with deep muciferous channels. Mouth moderate, somewhat oblique. Jaws nearly equal, the lower slightly more prominent. Teeth upon the intermaxillary and the mandible; palate, vomer, and tongue toothless. Eyes minute, rudimentary. A single short dorsal of about 12 rays (number of spines not determined, possibly rudimentary). Vent under the middle of the base of the dorsal; origin of the anal under the posterior fourth of the dorsal. The anal fin with 8 or more rays (number of spines, if any not rudimentary, not determined). Ventral fins thoracic and with ten rays. Pseudobranchiæ present. No swim-bladder.

This genus, was founded by Vaillant upon the five specimens of a species described by him under the name of *S. cocles*. The material studied by him was badly preserved, and the diagnosis, especially of the vertical fins, is unsatisfactory. At first, led by superficial resemblance, the form was believed to belong close to the old genus *Scopelus*, and the unfortunate name *Scopelogadus* is intended to describe a Scopelus-like fish with thoracic fins. In an appendix to his great work, Vaillant expresses the opinion that he had erred in forming a new genus, and that it belongs properly to *Melamphaes*, of Günther.

Scopelogadus is well distinguished from both *Melamphaes* and from *Plectromus* by various characters, most prominent of which are the short head, comparatively small mouth, rudimentary eye, and short dorsal and anal fins, which overlap to the extent of nearly a third of the length of each.

SCOPELOGADUS COCLES, VAILLANT. (Figure 199.)

Scopelogadus cocles, VAILLANT, Exp. Sci., Travailleur et Talisman, 1888, 143, pl. XXVI.

Height of body one-fourth of total length (without caudal); length of head three-tenths. Eye minute, rudimentary. Length of the maxillary half the length of the head; length of pectoral equal to that of the head, its tip extending far behind the vent and to the vertical from the base of the antepenultimate dorsal ray; length of the ventral about half that of the pectoral, its tip not reaching to the vent. Scales large, about 21 in the longitudinal series—2 above and 4 below. Dorsal placed midway between the snout and the base of the upper caudal rays (not the antecedent rudimentary spines). Origin of the anal under the base of the preantepenultimate dorsal ray, the dorsal overlapping it nearly one-half of its length.

Radial formula: D. 12; A. 8+; V. 10.

A long description, accompanied by several figures of anatomical details, is given by Vaillant. The species was described from four specimens obtained on the Banc D'Arguin at depths of from 1,090 to 1,250 meters, and off the Cape Verde Islands at 3,655 meters.

MALACOSARCUS, Günther.

Malacosarcus, GÜNTHER, Challenger Report, XXII, 30.

Head large and thick, with bones very thin, and with wide and deep muciferous cavities; also the canal along the lateral line is much distended. Cleft of the mouth wide, obliquely descending backwards, with jaws nearly equal in front. A narrow band of villiform teeth in both jaws; palate toothless. Eight branchiostegals, pseudobranchiæ present. The edges of the preoperculum and the lower edge of the mandible with minute and distant spines. Scales extremely thin, not sculptured, deciduous, irregular, and of moderate size. One dorsal; caudal emarginate, with broad basal fold above and below; anal spines very feeble. Ventrals small, five-rayed, inserted at some distance behind the pectorals. Gills four; gill-laminæ short; gill-rakers long, needle-shaped. (*Günther*).

Although this fish is only a degraded form of *Melamphaes*, Günther decided to make it the type of a distinct genus, since otherwise the generic definition of *Melamphaes* would lose much in precision.

This peculiar genus is represented by the single species *M. macrostoma*, Günther (Ann. and Mag. Nat. Hist., 1878, vol. II, p. 186; Challenger Report, Vol. XXII, p. 30), obtained in the mid-Pacific, *Challenger* station 271, at a depth of 2,425 fathoms, 3½ inches long; and near the Low Archipelago, station 276, at a depth of 2,350 fathoms, 3½ inches long. No vestige of it has yet been found in the Atlantic.

POROMITRA, Goode and Bean.

Poromitra, GOODE and BEAN, Bull. M. C. Z., X, 1883, 214.—GÜNTHER, Challenger Report, XXII, 34.

Body short, compressed, scopeliform, covered with thin, cycloid scales. Head very large, nearly half the entire length of the fish to base of caudal, with scales upon cheeks, suboperculum, and probably elsewhere. No barbel. Mouth very large, the lower jaw projecting. Margin of upper jaw composed of a short intermaxillary and a long maxillary. Teeth cardiform, numerous, very small, on the intermaxillaries and mandibles: none discovered on maxillaries, palatines, or vomer. Opercular apparatus complete.

Dorsal fin in the middle of the body, its origin not far behind that of the ventrals, the spinous and soft portions subequal in length. Anal much shorter than dorsal, its middle under the end of the dorsal, or nearly so. Pseudobranchiæ present. Gill openings very wide, separate.

POROMITRA CAPITO, Goode and Bean. (Figure 200.)

Poromitra capito, Goode and Bean, Proc. U. S. Nat. Mus., 1882, 215; Bull. Mus. Comp. Zoöl., x, 215.—Günther, Challenger Report, xxii, 34.—Jordan, Cat. Fish. N. Amer., 1885, 75.

Height of the body two-sevenths of its length to base of caudal rays; its width about one-half its height. Scales as large as the pupil, with concentric striæ, about twenty-four in the lateral line and about ten in the transverse series.

Head about two-fifths of standard length, somewhat resembling in appearance that of *Alepocephalus Bairdii*. The eye is large, circular, located normally. The length of the upper jaw is three-sevenths that of the head; that of the lower jaw about one half. The end of the maxillary is nearly in the perpendicular from the posterior limb of the pupil. The length of the snout is about equal to the least diameter of the eye. The distance from the limb of the preoperculum to the end of the opercular flap is equal to that from the tip of the snout to the posterior margin of the orbit. Teeth as described in generic diagnosis. Dorsal fin inserted midway between tip of snout and origin of middle caudal rays. The fin is mutilated and its outline can not be determined; it is composed of 7 or 8 spines and 6 soft rays, and the length of its base is nearly equal to the height of the body at its insertion.

The anal fin is inserted in the perpendicular from the base of the eighth dorsal ray. It is composed of nine rays, and the length of its base is half that of the dorsal base.

The pectoral is inserted far below the axis of the body, and with a single scale between its axil and the branchial opening. Its length is twice the distance of its insertion from snout.

The ventral is minute (apparently) and is inserted in advance of the pectoral; it has about 7 or 8 rays.

The caudal is mutilated, but seems to be composed of 15 rays.

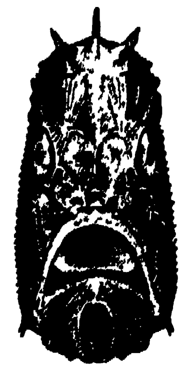
Radial formula: D. VII or VIII, 6; A. 9; V. 7 or 8; P. 12; C. 15.

Two specimens of this species were secured by the *Blake;* one from station CCCXXVIII, in 34° 28′ 25″ N. lat., 75° 22′ 50″ W. lon., at a depth of 1,632 fathoms; the other from an unknown locality.

ANOPLOGASTER, Günther.

Anoplogaster, Günther, Cat. Fish. Brit. Mus., i, 1859, 12; Challenger Report xxii, 25.

Body compressed, deep, with the scales reduced to minute asperities. Head large, with thin bones and wide muciferous cavities. Cleft of mouth wide and oblique; chin prominent. Muzzle short, rounded, not protruding. Teeth in villiform bands in the jaws, with several larger teeth in the lower jaw; palatine toothless. Eye large. Preoperculum entire. Suprascapulary and angle of preoperculum armed with a spine. Dorsal without spines and with about 17 rays. Anal with 9 to 10 rays. Ventral with 1 spine and 6 rays. Air-bladder small, pyriform. Branchiostegals, 8. Gill openings very wide.



ANOPLOGASTER CORNUTUS—FRONT VIEW.

ANOPLOGASTER CORNUTUS, (CUVIER & VALENCIENNES), GÜNTHER. (Figure 203.)

Hoplostethus cornutus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IX, 470.

Anoplogaster cornutus, GÜNTHER, Cat. Fish. Brit. Mus., I, 12; Challenger Report, XXII, 25.—LÜTKEN, Oversigt k. d. Vid. Selsk. Forhandl., 1877, 181, pl. V, figs 4-7.

Height of body somewhat more than half the total length (without caudal); greatest width a little more or less than half its height. Head a little more than one-third of total. Eye nearly one-third of head; interorbital width nearly one-half that of the head. Suborbital arch with seven cavities; the bony ridges of the head terminating in several blunt points. Ventrals midway between tip of snout and base of caudal.

Radial formula: D. 17; A. 9–10; P. 16; V. 7.

This species was described from three specimens, 32 to 43 millimeters in length, taken from the stomach of an albicore, in 31° N. lat., 40° W. lon. Another, 77 millimeters long, was taken from the stomach of some other pelagic fish, in 25° N. lat., 31° W. lon.

A specimen was obtained by the *Albatross*, in N. lat. 39° 18′ 30″, W. lon. 68° 24′.

CAULOLEPIS, Gill.

Caulolepis, GILL, Forest and Stream, XXI, August 30, 1883; Proc. U. S. Nat. Mus., VI, 1884, 258, 259.—JORDAN, Cat. Fish. N. Amer., 1885, 24.—GÜNTHER, Challenger Report, XXII, 25.

Berycids with a laterally oval or broad pyriform contour, a compressed body covered with small, pedunculated, leaf-like scales, an abruptly declivous forehead, small eyes, a pair of very long, pointed teeth in front of upper jaw closing in front of lower, a similar pair of still longer pointed teeth in the lower, received in foveæ of the palate; on the sides of each jaw two long teeth terminating in bulbous tips; a row of minute teeth on the posterior half of the supramaxillaries, and a toothless palate.

This genus, closely related to *Anoplogaster*, is represented by a single Atlantic species. The details of its structure are described more fully in the following notes communicated in manuscript by Dr. Gill:

Body compressed, pyriform, highest in front, and with the dorsal and inferior outlines converging to caudal peduncle, which is moderately long and slender.

Scales small and not or scarcely imbricated, upraised by peduncles, and with the surface extended and dentate behind.

Lateral line distinct and developed as a groove running parallel with the back and continuous to the base of the caudal fin.

Head higher than long, with the cranial portion very declivous, and with the suspensorial portion obliquely extended downwards and backwards; the cranium above with three naked membranous areas, an anterior pair pointed forward and diverging to receive the ascending process of the intermaxillaries and a median hastiform one behind; also with a naked horseshoe-shaped area around the nape; the naked spaces being separated by the bony bars limiting the large muciferous cavities; suborbital bones enlarged, sculptured, and with small, erect spines; the first with three radiating bars; the second largest, sending four depending processes, three forward or downward, and another articulating with the preoperculum above its angle; the postorbital expanding distally and articulating with the preoperculum above; the interspaces covered by a tense skin with the extension of the scales imbedded in it.

Preoperculum angulated downward and backward, spinigerous at the angle and with no horizontal lines; opercular apparatus much reduced; the operculum extended downward, with numerous striæ and ridges and with three more diverging ridges extended backwards or downward into spiniform angles, one horizontal and the others oblique, leaving emarginated interspaces between; the inter- and suboperculа small, the latter with several striæ pointed backward.

The eye moderately developed near the anterior profile. Upper jaw not protractile, with the intermaxillaries extended far backward and the supramaxillaries lying behind and above, and with wide oval extremities furnished with radiating ridges or striæ.

Lower jaw quite deep with an upper and lower portion longitudinally striated and an intermediate region provided with a naked skin, and with its angle emitting a spine backward; chin flattened backwards to a median inferior point; teeth enlarged and few, in a single row in each jaw. (1) In the upper a pair slightly curved and regularly pointed, closing in front of lower jaw, and on each side two at intervals, behind much smaller and with swollen blunt tips. (2) In the lower jaw a pair near the symphysis more separated than those of the upper and fitting into foveæ of the palate on each side; two smaller teeth nearly straight and with globular points, the first intermediate between the first and second of the upper, and the second behind the second lateral tooth of the upper jaw; palate and tongue edentulous. (3) A row of very small teeth around the posterior half of the supramaxillary.

Dorsal single, commencing above the upper axil of the pectoral, with 2 spines and 17 bifurcate rays, the last of which is double; anal short, mostly behind the dorsal, with 2 spines, the first very short, and 8 bifurcate rays, the last double; caudal deeply emarginated, but with rounded lobes; pectorals obliquely inserted, of moderate size, with 1 simple and about 14 branched rays; ventral fins subabdominal or decidedly behind the pectorals, with 1 spine and 6 branched rays. Branchial apertures deeply cleft; branchiostegal rays, 8.

CAULOLEPIS LONGIDENS, GILL. (Figure 204.)

Caulolepis longidens, GILL, Proc. U. S. Nat. Mus., VI, 259.—JORDAN, *loc. cit.*—GÜNTHER, *loc. cit.*

Greatest height of body one-half its length inclusive of caudal; length of head two and four-fifths times in length of body, and almost equal to the height of the body. Upper jaw from the symphysis to the end of the supramaxillary contained 3½ times in the total length. The orbit contained 4 times in the length of the head. The front teeth of the upper jaw are considerably longer than the diameter of the orbit; those of the lower nearly twice as long. The scales are very peculiar, foliaceous and pedunculate. Color, uniform black.

Radial formula: D. II, 17; A. II, 8; C. X-19-X; P. I, 14; V. I, 7.

MEASUREMENTS.

	Inches
Extreme length	4.7
Body:	
Greatest height	51
Greatest width	18
Height at ventrals	49
Least height of tail	9.5
Head:	
Greatest length	38
Greatest width	20
Width of interorbital area	13
Length of snout	12
Length of upper jaw	34
Length of mandible	32
Diameter of orbit	8
Dorsal:	
Distance from snout	47
Length of base	41
Length of longest ray	12
Length of first ray	4

	Inches
Anal:	
Distance from snout	73.5
Length of base	9
Length of first ray	1.5
Length of second ray	4
Length of longest ray	12
Length of last ray	7.5
Caudal:	
Length of middle rays	11
Length of outer rays	20
Pectoral:	
Distance from snout	37
Length	28
Ventral:	
Distance from snout	27
Length	21

A single specimen (Cat. No. 33270, U. S. N. M.), 4.7 inches in length, was taken by the *Albatross* from station 2034, in 39° 27′ 10″ N. Lat., 69° 56′ 20″ W. Lon., at a depth of 1,346 fathoms."

Family STEPHANOBERYCIDÆ.

Stephanoberycidæ, GILL, Standard Natural History, III, 1885, p. 182. (Name only.)

Body oblong, compressed, with scales of peculiar form, circular, having in the center of each, one or two erect, conspicuous spines, and in arrangement scarcely imbricated. Head large, thick, oblong, cavernous, with short convex snout, and with thin osseous ridges, especially an inner U-shaped one on the crown, whose limbs diverge on each side of the nape; also an outer sigmoid ridge on each side above the eyes, continuous with a similar ridge projecting from the nasal bone, the inner and outer ridges being connected by a cross ridge opposite the anterior margin of the orbit. The mouth is very wide and somewhat oblique. Lower jaw slender and slightly projecting. Maxillaries large; premaxillaries protractile; suborbitals narrow. Teeth small, in a single band on the intermaxillaries and dentaries; palatine toothless. Bones of the head usually serrated. Branchiostegals VII–VIII; gill membranes separate, 3; gills 4, a slit behind the fourth. Pseudobranchiæ present. Gill-rakers moderate. A single dorsal. Dorsal and anal without spinous rays. Ventral fins abdominal, farther back in the adult than in the young, with 1 spine and 5 rays.

STEPHANOBERYX, GILL.

Stephanoberyx, GILL, Proc. U. S. Nat. Mus., VI, 1883, 258.–JORDAN, Cat. Fish. N. Amer., 1885, 74.

Beryoids with an elongated claviform contour, body covered with cycloid scales, scarcely imbricated, and armed about the center with one or two erect spines. An oblong head, with a moderate, convex snout, and with thin osseous ridges, especially an inner U-shaped one on the crown, whose limbs diverge on each side of the nape, and an outer sigmoid one on each side above the eyes, and continuous with one projecting from the nasal; the inner and outer ridges connected by a crossbar on a line with the anterior margin of the orbit; rather small eyes in the anterior half of the head, and the teeth small, acute, and in a band on the intermaxillaries and dentaries; palate toothless. Ventrals with 1 spine and 5 rays.

STEPHANOBERYX MONÆ—FRONT VIEW.

STEPHANOBERYX MONÆ, GILL. (Figure 205.)

Stephanoberyx Monæ, GILL, Proc. U. S. Nat. Mus., VI, 1883, 258.

The type of the species is a young specimen, about 2 inches long. For comparison with *S. Gillii* we have used examples measuring 4½ inches from *Albatross* station 2392.

In one of these the eye is two-ninths as long as the head and nearly equal to the snout; the head equals one-third of total length to caudal base, the greatest depth of the body two-sevenths of the same length. The upper jaw is slightly longer than the postorbital part of the head. Gill-rakers long and slender, about 25 below the angle on the first arch. The distance of the anal origin from the end of the head equals two-thirds length of head. The ventrals originate under the middle of the pectorals.

Color, brownish.

Radial formula: D. 14; A. 13–14; P. 10; V. I, 5.

The type specimen of this species (Cat. No. 33445, U. S. N. M.) was obtained by the *Albatross* from station 2077, in 41° 09′ 40″ N. Lat., 66° 02′ 20″ W. Lon., at a depth of 1,255 fathoms. Other specimens were taken by the *Albatross* as follows: From station 2385, in 28°

51′ N. Lat., 88° 18′ W. Lon., at a depth of 730 fathoms; station 2392, in 28° 47′ 30″ N. Lat., 87° 27′ W. Lon., at a depth of 724 fathoms; station 2393, in 28° 43′ N. Lat., 87° 14′ 30″ W. Lon., at a depth of 535 fathoms; station 2384, in 28° 48′ N. Lat., 88° 15′ 30″ W. Lon., at a depth of 940 fathoms; station 2117, in 15° 24′ 40″ N. Lat., 63° 31′ 30″ W. Lon., at a depth of 683 fathoms, and station 2140, in 17° 36′ 10″ N. Lat., 46° 46′ 05″ W. Lon., at a depth of 966 fathoms.

The *Blake* also secured a specimen from station XCVI, off Guadeloupe, at a depth of 709 fathoms.

STEPHANOBERYX GILLII, GOODE and BEAN, n. s. (Figure 206.)

The type specimen is No. 33555, U. S. Nat. Museum, obtained from *Albatross* station 2099; its length is 6 inches. Two additional examples from *Albatross* station 2102 have also been used for the purpose of this description; one of these is 4⅝ inches long and the other 5½ inches.

The diameter of the eye equals length of snout and one-fourth length of head, which is one-third of total length to caudal base. Greatest depth of body two-sevenths of total without caudal. The upper jaw is as long as the postorbital part of the head. Gill-rakers long and slender, about 15 below the angle on the first arch. The ventral origin is behind the end of the extended pectoral. The distance of the anal origin from end of head fully equals length of head.

About 33 rows of scales from head to base of caudal; 9 rows above and 7 below the lateral line.

Radial formula: B. 7; D. 11; A. 11; P. 13; V. I, 5.

Color, in spirits, pale, the back, in front of dorsal, showing traces of rose.

The species may readily be distinguished from *S. monæ* by its smaller number of dorsal and anal rays and gill-rakers, the position of its ventrals, and the greater length of its trunk.

Specimens were obtained from *Albatross* stations 2099 (2,949 fathoms), 2102 (1,209 fathoms), and 2196 (1,230 fathoms).

Family TRACHICHTHYIDÆ.

Trachichthyoidei, BLEEKER, Tentamen, 1859, XIX. (Familia 73).

Body ovate, deep, much compressed, with small or moderate ctenoid scales. Abdomen protected by a dermal scute, forming a serrated edge. Head large, deeper than long; superficial bones excavated, and with conspicuous muciferous cavities. Mouth very wide, oblique. Villiform teeth in the jaws and on the vomer. *Suborbitals very broad, covering the cheeks.* Branchiostegals 8. Gill-openings wide; gill-laminæ very short. A single dorsal fin, with a few anterior spinous rays. Ventrals with 6 soft rays.

In this family are included two genera: *Trachichthys*, with teeth upon its vomer, operculum with spine, and with two anal spines, and *Hoplostethus*, with toothless vomer, operculum entire, and 3 anal spines.

TRACHICHTHYS, Shaw.

Trachichthys, SHAW, Nat. Misc. 1798, X, pl. 378.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 229.—LOWE, Fishes of Madeira, 55.—GÜNTHER, Cat. Fish. Brit. Mus., I, 10; Challenger Report XXII, 21.

Body compressed, more or less deep, covered with small ctenoid and generally rough scales, which are rather irregularly arranged. Abdomen protected by dermal scutes, which form a serrated edge. Head very large, the superficial bones being deeply sculptured to receive wide muciferous cavities which are covered by thin skin only. Mouth very wide, oblique; villiform teeth in the jaws and on the vomer and palatine bones. Eight branchiostegals; gill-openings very wide, gill-laminæ very short. Suprascapulary and angle of the preoperculum armed with a spine each. One dorsal fin, the anterior rays of which are spinous; ventrals with 6 soft rays; pectoral symmetrical; caudal deeply forked. (*Günther.*)

Eight species of *Trachichthys* are known, of which one is found in the Atlantic, and all of these have been described from floating specimens, presumably originating in the ocean depths. *T. intermedius*, however, was obtained by the *Challenger* near New Zealand, at a depth of 275 fathoms, and by the *Investigator* in the Bay of Bengal, 272 fathoms; and previously by Hector, off Cape Farewell, New Zealand, in 400 fathoms. (Hector, Tr. New Zealand Inst. VII, 245, pl. XI, fig. 18 A. Günther, Challenger Report, XXII, 24, pl. V., fig. D. Alcock, Ann. and Mag. Nat. Hist., 1889 (Nov.), 380.

TRACHICHYTHYS DARWINII, JOHNSON. (Figure 207.)

Trachichthys Darwinii, JOHNSON, Proc. Zoöl. Soc. London, 1866, 311, pl. XXXII.—GÜNTHER, Challenger Report, XXII, 25.

Trachichthys japonicus, STEINDACHNER and DÖDERLEIN, Denkschr. d. k. Akad. d. Wiss., Wien, 1883, XLVII, 218, pl. II.

The height is two-fifths of the total length to base of caudal. The head is two-sevenths of the total length. Mouth very large and nearly vertical. Its superior border formed by the styliform intermaxillary. A wide notch at the symphysis of the intermaxillaries. Maxillary long and stout, dilated below, with a large supplementary striate plate, as in *Beryx*. The maxillary reaches the vertical from the middle of the eye. Lower jaw included, its bones strongly and deeply striate. Intermaxillary and mandible with narrow bands of villiform teeth, the innermost row a little enlarged. Bands of villiform teeth on the palate. A small round patch of similar teeth on the vomer. Nostrils close together near the upper anterior part of the orbit, the posterior the larger. Eye nearly round, placed high, but not reaching the profile, its length 4½ times in that of the head. Edge of opercle irregularly serrate or sinuous. A spine at the lower end of the subopercle. Large, imbricated, striate, bony plates (ten in the specimen) form a ventral keel extending from the root of the ventral fin to the vent, increasing in size from each end of the series to the middle. Dorsal origin behind the root of the pectoral; nearer the snout than the base of the caudal. The fourth dorsal spine the longest. Soft dorsal higher than spinous, the third and fourth rays longest. A series of large, rough scales, somewhat trapezoidal in shape, at each side of the dorsal and anal fins. The pectoral does not reach nearly to them, but to the vertical of the seventh dorsal spine. Ventral inserted under root of pectoral, consisting of a long, stout, striated spine and six branched rays. Caudal deeply forked, membrane between its rays covered with rows of small scales. Lateral line on the upper part of the body, not following the curve of the back.

The head and all the fins are of a bright red color; the back is of brownish red, passing into gray on the sides; the belly is white, tongue black; also the inside of the mouth and gill-covers. Sometimes the inside of the gill-covers is marked with black patches. Palate red.

Radial formula: D. VIII, 14; A. III, 12; V. I, 6; L. lat., 27. Pyloric cæca 13.

This species differs from the Antarctic one in having the bones of head more solid, narrower, muciferous; a smaller eye and the spinous dorsal fin more differentiated from the soft. The scales are small. Abdominal scutes ten. The height of the body is less than half the total length (without caudal); the diameter of the eye two-ninths of the length of the head. No projecting suprascapulary spine. The third and fourth dorsal spines are the longest, and the seventh is shorter than the eighth.

Only one specimen, 19 inches long, was obtained off Madeira in the month of April. Mr. Johnson adds that from the protruded stomach and inflated membrane about the eye, it may be inferred that the fish came from a great depth. Like so many other Madeiran fishes, this species occurs also in Japan, where it was met with by Döderlein, who seems to have been unacquainted with Johnson's description. (*Günther.*)

HOPLOSTETHUS, Cuvier and Valenciennes.

Hoplostethus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 1829, 469, pl. 97, bis.—GÜNTHER, Cat. Fish. Brit. Mus., I, 9.—JORDAN and GILBERT, Bull. 16, U. S. Nat. Mus., 458.
Trachichthys (in part), LOWE, Fishes of Madeira, 55.

Body deep, compressed. Scales moderate, somewhat ctenoid; lateral line present, its scales enlarged; abdomen with a series of bony plates, each ending in a retrorse spine. Head large, deeper than long, with very conspicuous muciferous cavities, covered by thin skin. Eye very large. Mouth very wide, oblique; the jaws equal when it is closed. Jaws and palatines with fine, villiform teeth; vomer toothless. A strong spine at the angle of the preopercle; the long vertical limb of the preopercle finely serrated. Gill membranes separate, free from the isthmus. Dorsal fin single, short, the spines graduated, 6 in number; anal with 3 graduated spines; caudal forked, its rudimentary rays spinous; pectorals symmetrical, rather long; ventrals I, 6, rather short. Air bladder simple. Pyloric cæca numerous. Vertebræ 11+15.

HOPLOSTETHUS MEDITERRANEUS, CUVIER and VALENCIENNES. (Figure 208.)

Hoplostethus mediterraneus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 469, pl. XCVII.—GUICHENOT, Explor. Alger. Poiss., 42.—GÜNTHER, Cat. Fish. Brit. Mus., I, 9; Ann. and Mag. Nat. Hist., 1878, I, 485.—JORDAN and GILBERT, Bull. 16, U. S. N. M., 458.—MOREAU, Hist. Nat., Poiss. de la France, II, 322.—STEINDACHNER, Denkschr. d. k. Akad. d. Wiss. Wien, 1883, XLVII, 218, pl. I.
Trachichthys speciosus, LOWE, Proc. Zool. Soc., London, 1889, p. 77; Fishes of Madeira, 55, pl. IX.
Hoplostethus japonicus, HILGENDORF, Sitzungsb. Gesellsch. Naturf. Freunde, Berlin, 1879, 78.

Eye large, its diameter longer than snout, and about one-third the length of the head. Abdominal plates 9 to 13 in number. Body above with very small roughish scales; sides in young nearly or quite naked (example seen); scaly in the adult. Pectorals reaching first soft ray of anal; ventrals to vent; fins rather low. Color silvery, rosy in life; fins scarlet, peritoneum and inside of mouth black.

Radial formula: D. VI, 12-15; A. III, 8-11; V. I, 6; L. lat. 28-31.

Specimens of this species have been discovered at distant intervals of time at considerable depth (the precise depth is not known) in the western parts of the Mediterranean, off Madeira, and recently also in the sea of Japan. Dr. Hilgendorf was of opinion that he could specifically distinguish Japanese specimens by a somewhat larger number of abdominal scutes. This would have been a character insignificant enough, even if the Japanese specimens had not sometimes the same number of scutes as the Mediterranean. A more important difference seems to be the structure of the scales, which I find in Japanese specimens, on the whole, less strongly ctenoid than the Madeiran. But even in this respect there is no constancy in specimens from either of the two localities. (*Günther.*)

Specimens have been obtained by the *Albatross* as follows: From station 2125, in 11° 43′ N. lat., 69° 09′ 30″ W. lon., at a depth of 208 fathoms; station 2376, in 29° 03′ 15″ N. lat., 88° 16″ W. lon., at a depth of 324 fathoms; Cat. No. 35656, U. S. N. M., from station 2232, in 38° 37′ 30″ N. lat., 73° 11′ W. lon., at a depth of 243 fathoms, and Cat. No. 35414, U. S. N. M., from station 2176, in 39° 32′ 30″ N. lat., 72° 21′ 30″ W. lon., at a depth of 302 fathoms. Also by the *Fish Hawk* as follows: Cat. No. 28879, U. S. N. M., from station 1026, in 39° 50′ 30″ N. lat., 71° 23′ W. lon., at a depth of 182 fathoms; Cat. No. 28906, U. S. N. M., from station 1025, in 39° 49′ N. lat., 71° 25′ W. lon., at a depth of 216 fathoms; Cat. No. 29052, U. S. N. M., from station 1045, in 38° 35′ N. lat., 73° 13′ W. lon., at a depth of 312 fathoms; Cat. No. 30277, U. S. N. M., from station 998, in 39° 43′ N. lat., 71° 32′ W. lon., at a depth of 302 fathoms, and Cat. No. 26726, U. S. N. M., from station 897, in 37° 25′ N. lat., 74° 18′ W. Lon., at a depth of 157½ fathoms.

HOPLOSTETHUS ATLANTICUS, COLLETT.

Hoplostethus atlanticus, COLLETT, Bull. Soc. Zoöl, France, 1889, 306.

Height of body contained 2.7 times in the total length (caudal included); length of head 3 times. Diameter of the eye a little greater than the length of the snout; contained

3½ times in the length of the head. The scales are very small (much more so than in *H. mediterraneus*), the diameter of the scales of the body being one-seventh that of the scales of the lateral line; they are nearly circular, and have a few little spines. Ventral keel indistinct. Dorsal and anal spines feeble. Ventrals extending scarcely to the vent.

Radial formula: D. VI, 17; P. I, 17; V. I, 6; A. II, 11; C. VII, 18, 8.

This species is distinguished from *H. mediterraneus* by the relatively smaller size of its eyes and scales, by the indistinct ventral cuirass, and by the greater number of rays in the fins. The type was a single specimen taken off Flores in the Azores, July 30, 1888, by the steam yacht *Hirondelle* at a depth of 1,557 meters.

Family BATHYCLUPEIDÆ.

Bathyclupeidæ, GILL, MS.

Acanthopterygians with a pneumatic duct to air-bladder, ventradiform body, cycloid scales, straightish lateral line, flattish excavated crown, long intermaxillaries extending as far back as the supramaxillaries; short postmedian dorsal without spines; long anal with one spine, and small, subjugular ventrals with a spine and five rays each.

This family shares with Berycoideans a persistent pneumatic duct. (*Gill.*)

BATHYCLUPEA, Alcock.

Bathyclupea, ALCOCK, Ann. and Mag. Nat. Hist., VIII, 1891, 130.

Acanthopterygians with compressed head and body; head with large mucous cavities: lower jaw prominent. Teeth on jaws, palatines and vomer, small, villiform. Gill-openings large. Branchiostegals 7. Pseudobranchiæ present, large. Scales cycloid, deciduous. Lateral line distinct, nearly straight. Dorsal fin postmedian, with one or two spines and eight or ten rays. Pectorals large, pointed, the upper rays the longest. Ventrals subjugular, small. Caudal furcate.

The type, *B. Hoskynii*, Alcock (*loc. cit.*, fig. 4) was obtained from the Andaman Sea by the *Investigator* at station 115, depth 188–220 fathoms, the largest of the four specimens obtained being 8 inches in length.

BATHYCLUPEA ARGENTEA, GOODE & BEAN, n. s. (Figure 415.)

Head ana body compressed; the body covered with large, cycloid, deciduous scales. Height of body at vent less than length of head, equal to distance from posterior margin of orbit to end of lower jaw. Length of head contained in that of body (without caudal) 3 times. Diameter of orbit 2⅔ times in length of head, and slightly greater than the distance from its anterior margin to the tip of the lower jaw, the length of the snout being about two-thirds the diameter of the orbit, and twice the width of the interorbital space. Mouth subvertical, the length of the upper jaw slightly exceeding the diameter of the orbit. Teeth in villiform bands on jaws, palatines and vomer. The dorsal fin placed at a distance from the tip of the snout equal to twice the height of the body; its first ray inserted in the vertical from the base of the seventh anal ray. Pectoral slender, its upper rays the longest, extending considerably beyond the origin of the anal. Ventrals small, fan-shaped, inserted almost under the posterior margin of the orbit. Color, yellowish silvery.

Radial formula: D. 9; A. 30; V. 6; L. lat. 35.

The type is a specimen, 13 inches in length, obtained by the *Blake* at station XXXVII, off Neris, at a depth of 365 fathoms.

Family ANOMALOPIDÆ.

Anomalopidæ, GILL, MS.

Acanthopterygians with a compressed oblong body covered with small spinigerous scales; continuous lateral line near back; scaleless head, with sculptured tubiferous roof and infraorbital glands; nostrils large, not separated from the eyes by osseous interspaces;* seven branchiostegals; a first dorsal with about five weak spines, the second and anal oblong, and normal thoracic ventrals (I, 5). (Gill, MS.)

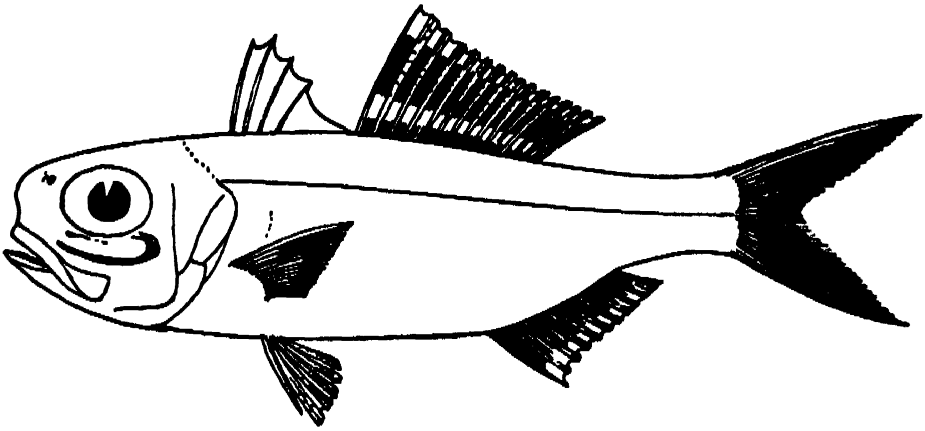
This family is represented by a single species and a single genus—*Anomalops palpebratus* (Boddaert), Günther, known only from eight specimens, four from Amboina and Manado, one from the Fiji Islands, one from the Paumoto Archipelago, and two others from the New Hebrides, the types of Ogilby's recent valuable paper, "Redescription of Anomalops palpebratus." (Records of the Australian Museum, Sydney, I, 1890, 69–71.)

This form was placed by Günther in the family *Carangidæ*, but this assignment was professedly provisional, since he had never been able to examine the specimens. The original assignment by Bleeker and Kner to the *Berycidæ* was more nearly exact, but, as Dr. Gill has shown, it seems to possess positive and distinctive family characters of its own.

ANOMALOPS, Kner.

Anomalops, **Kner**, Sitzungsberichte Akad. Wiss. Wien., LVIII, 1868, p. 284, pl. I., Fig. 1.

Body oblong, covered with small rough scales. Snout very short and convex; mouth very wide. Eyes very large; a glandular, elongate, and partly free, luminous organ occupies a hollow of the infraorbital ring below the eyes. Villiform teeth in the jaws and on the palatine bones; vomer toothless. First dorsal short; second and anal moderately long; caudal forked. (*Günther.*)



ANOMALOPS PALPEBRATUS.

According to Günther, *Anomalops palpebratus* lives in great depths, and comes to the surface at night or by accident only. "The peculiar organ below the eyes," he writes, "is without doubt of the same nature and has the same function as similar structures on the side of the head of other deep-sea fishes; as in *Pachystomias*, it is partly free, as if it could be made to protrude out of the pit in which it lies."

Family CARANGIDÆ.

Carangini, **Bonaparte**, Catalogo Metodico, Pesci Europei, 1876, 75.
Carangoidei, **Bleeker**, Tentamen, 1859, XXIII, (Familia 100).—**Günther**, Cat. Fish. Brit Mus. II, 1860, 417.
Carangidæ, **Gill**, Proc. Acad. Nat. Sci. Phila., 1862, 430; Arr. Fam. Fishes, 1872, 8 (No. 79); Proc. U. S. Nat. Mus., V, p. 487, 1883.

This family is so little bathybial in its range that it may be passed over with a brief allusion. The family includes perhaps two hundred species, many of which are semipelagic in habit but which, so far as is at present known, live near the shores and in the upper water. There is no evidence that any of them breed far from the coasts, except it may by *Naucrates*. Most of them are probably restricted in range, so far as individual migrations are concerned. *Seriola*, *Oligoplites*, *Trachynotus*, and some of the large species of *Caranx*, such as *C. hippos*, are powerful swimmers, and are likely to make long journeys, at least as far as from the West Indies to the Bermudas, where many of the species occur casually. Others, like *Selene*, drift far and wide with the currents, and are found in mid ocean, apparently under much the same conditions as in *Nomeus*. *Nomeus* is, however, characteristically a mid-ocean fish, and is not known to breed near the shores, but there is good reason to believe that *Selene* does.

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* "Nostril large, not separate from the eye by an osseous interspace." Ogilby, *loc. cit.*, p. 71.

Seriola Dumerilii, Risso, is said by Canestrini to occur everywhere in the Mediterranean, but to dwell at great depth (*a grande profondita*), so that its capture is uncommon. The young of *Seriola* are pelagic surface forms.

Caranx amblyrhynchus, C. & V. has been found several times under circumstances which would seem to indicate that it came from very great depths, but it so closely resembles in structure the other members of the genus that it is hard to believe that there is not some error of observation. It was brought up by the *Blake* at station 324 (Lat. 33° 27″, lon. 75° 53′ 30″), in 647 fathoms.

Porthmeus amia (*Lichia amia*, Auctorum, in its adult form—*Porthmeus argenteus*, in young state) is while young a pelagic form, and has been found off the west coast of Africa. The young of *Chorinemus* and of *Oligoplites* are, according to Lütken, also pelagic (Spolia Atlantica, p. 192 (600)). Two species belonging to this family have been taken in the deep-sea nets, but it seems hard to believe that they were caught at the bottom.

Family SCOMBRIDÆ.

Gli Scombrini, RAFINESQUE, Indice d'Ittioliogia Siciliana, 1810,

Scombrini, BONAPARTE, Cat. Metodico, 73 (Sub. fam. 228).

Scombroidei, BLEEKER, Tentamen, 1859, XXII, (Familia 95).

Scombridæ, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 124; Arr. Fam. Fishes, 1872, 8 (No. 78).—(GÜNTHER, Cat. Fish. Brit. Mus., II, 349–373.—*Trichiuridæ*, in part, and *Scombridæ*, in part).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 422.

Physoclystous Acanthopterygians, with body elongate, fusiform; the scales minute or wanting (generally cycloid, but about the thorax larger ones, sometimes ctenoid, are developed, forming the so-called corselet of the tunnies). Lateral line distinct, frequently sinuous. Head subconic, pointed anteriorly. Mouth rather large, with lateral cleft; upper jaw not protractile; maxillary without supplemental bone; sharp teeth on the jaws and generally on the vomer, sometimes on palatines. Preoperculum entire; operculum well developed, unarmed; in the extremely young the preoperculum is usually armed with several radiating spines, subsequently absorbed and lost. Gill-openings large, confluent below. Gill-rakers usually long. Pseudobranchiæ present, large. A slit behind the fourth gill. Branchiostegals generally 7. Dorsal fins 2, the first composed of rather slender, spinous rays, depressible in a groove, the second with branched rays, the posterior ones usually detached and separate, forming series of finlets. The first dorsal is always either elongate or widely separate from soft dorsal. Anal similar to second dorsal. Caudal peduncle very slender, usually keeled, the caudal deeply forked, adapted for rapid propulsion. Ventrals moderate, thoracic. Vertebræ numerous (more than 25). Pyloric cæca well developed, numerous. Stomach sac-shaped. Air bladder frequently absent.

KEY TO THE GENERA.

I. Body fusiform, moderately elongate ....SCOMBRINÆ, Gill
  A. Spinous dorsal short (of less than 12 spines), with wide space separating it from second dorsal; pectorals high up; caudal not carinated.
    1. Vomer and palatines with teeth; corselet obsolete ....SCOMBER
    2. Vomer and palatines toothless; corselet well developed ....AUXIS
  B. Spinous dorsal long (of more than twelve spines), contiguous to the second; pectorals low; caudal with keels; pyloric cæca very numerous ....ORYCNINÆ, Gill
    1. Corselet imperfect or obsolete; teeth of jaws strong.
      a. 14 to 18 rays in spinous dorsal ....SCOMBEROMORUS
      b. 25 rays in spinous dorsal; jaws beak-like..ACANTHOCYBIUM

2. Corselet developed.
  a. Palatine teeth strong; vomer toothless; vertebræ normal ....SARDA
  b. Palatine teeth villiform.
    * Vomer with teeth; vertebræ normal, the lower foramina small.
      Lateral line single ....ORYCNUS
      Lateral line double..GRAMMATORCYNUS
    * * Vomer toothless; abdominal vertebræ with the lower foramina enlarged and a portion between the vertebræ proper and the hæmapophyses developed in the form of a network or trellis ....GYMNOSARDA

II. Body very elongate, compressed.
  A. Spinous dorsal long; pectorals comparatively low; caudal not keeled; pyloric cæca rather few.. THYRSITINÆ
    1. Ventrals well developed.
      a. Finlets present; teeth on palatines; body in greater part naked.
        * Lateral line descending below posterior part of the spinous dorsal; body rather elongate; dorsal and anal finlets 6 (Type, *Thyrsites atun*, South Africa and Van Diemen's Land) ....THYRSITES
        * * Lateral line nearly straight; dorsal finlets 5, anal 4; body rather elongate..THYRSITOPS
        * * * Lateral line absent; finlets few; skin spinigerous; abdomen keeled; body somewhat elongate ....RUVETTUS
      b. Finlets absent; palatines toothless; scales minute.
        * Dorsal in two portions. Dagger-shaped spine behind vent ....NESIARCHUS
        * * Dorsal continuous. Two lateral lines ....EPINNULA
    2. Ventrals reduced to a single spine.
      a. Finlets present; teeth on palatines, none on vomer.
        * Dagger-shaped spine behind vent. Body much compressed, incompletely covered with delicate scales.. NEALOTUS
        * * No dagger-shaped spine. Body slender, fusiform; lateral line descending in strongly oblique line below front of spinous dorsal......................PROMETHICHTHYS
      b. Finlets absent; teeth on palatines and vomer.
        * Ventral spine long, crenulate; preoperculum spinigerous ....DICROTUS
  B. Body very elongate (height 18 to 20 times in length); spinous dorsal very long, with numerous spines, continuous with the second; caudal not keeled; pyloric cæca not numerous ..... GEMPYLINÆ
    1. Body scaleless; no palatine teeth ....GEMPYLUS

Subfamily SCOMBRINÆ.

Scombrids with fusiform, moderately elongate bodies, and short (less than 12 spines) first dorsal fin, separated by a wide space from the second dorsal. Pectorals high up. Caudal not carinated.

Several of the forms in the subfamily occur at times far out at sea, but this is no reason for considering them properly pelagic. Like the common mackerel (*Scomber scombrus*), which also is found in schools remote from land, they probably all breed near the coasts, and depend for their food upon the shoals of small fishes and crustaceans, which are abundant near the land. *Scomber* spawns at considerable depths, but probably never beyond the 100-fathom line. It is probable that many of the *Scombridæ* sink at times far below the surface strata, especially in the winter. These matters are but little understood, however, and it is indeed probable that our knowledge of the bathic distribution of the members of the mackerel family is no more imperfect than our supposed knowledge of their geographic range and migrations. The remarks of Valenciennes in the "Histoire Naturelle des Iles Canaries" (*Poissons*, p. 49), though written fifty years ago, are worthy of consideration to-day.

Subfamily ORYCNINÆ.

Scombrids having a fusiform, moderately elongate body, and spinous dorsal long, composed of more than 12 spines, and contiguous to the second. Pectorals low. Caudal carinate. Pyloric cæca very numerous.

The tunnies, bonitoes, and horse mackerels composing this family are even more characteristically pelagic than those of the preceding subfamily, but never have as yet been found below 100 fathoms. There is every reason to suppose that at times they sink below the upper strata.

Subfamily THYRSITINÆ.

Scombrids with elongate, subfusiform, more or less compressed bodies, and long spinous dorsal. Finlets present or absent. Ventrals sometimes reduced to a single spine. Pectorals comparatively low. Caudal not carinated. Pyloric cæca rather few.

THYRSITES. CUV. & VAL.

Thyrsites, CUV. and VAL., Hist. Nat. Poiss. VIII, p. 196.—GILL. Proc. Acad. Nat. Sci., Phila., 1862, p. 126.

Body fusiform and rather elongate. First dorsal with less than 25 spines. Pectorals equidistant from the back and breast. Teeth on the palatines. Spinous dorsal contiguous to the soft, variable. Pectorals equidistant from the back and breast, or nearer the latter. Tail not keeled. Ventrals I, 5. Dorsal and anal finlets developed. Lateral line present. Dorsal and anal finlets 6. Lateral line abruptly decurved behind the last spines.

No species of this genus as modified by Gill has been found in the North Atlantic, but since it occurs in South African waters it is likely to occur farther to the north and the diagnosis and figures are introduced for comparison.

Thyrsites atun (Euphrasen) C. and V., is the only species. It is undoubtedly a deep-water form.

THYRSITOPS, Gill.

Thyrsitops, GILL, Proc. Acad. Nat. Sci. Phila., 1862.

Body fusiform, rather elongate. First dorsal with less than 25 spines. Spinous dorsal contiguous to the soft dorsal fin. Pectorals equidistant from the back and breast, or nearer the latter. Tail not keeled. Ventrals I, 5. Dorsal and anal finlets developed. Dorsal finlets 5, anal 4. Lateral line nearly straight.

THYRSITOPS LEPIDOPOIDES, CUVIER AND VALENCIENNES.

Thyrsites lepidopoides, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, 205, pl. CCXX.—GÜNTHER, Cat. Fish. Brit. Mus., II, 350.

Thyrsitops lepidopoides, GILL, Proc. Acad. Nat., Sci., Phila., 1862, 126.

A *Thyrsitops* with a somewhat robust body, having its height one-sixth of its total length, its thickness two-fifths of its height. The length of the head, as in *pretiosus*, is one-fourth of the total length. Nostrils so placed that the anterior is midway between the orbit and the tip of the snout, and the posterior midway between the anterior and the orbit. Lower jaw passing the upper, but obtuse. Teeth in the jaws small, those in the roof of the mouth anteriorly very large and conspicuous. A row of teeth on the vomer, and another along each palatine bone, small, short, and sharp. Tongue smooth. Operculum deeply emarginate, having two sharp points, flexible, intruding into the skin. First dorsal low, uniform in height, 17 very flexible rays, the length of which is about one-fourth of the height of the body, the last being very small. The length of the base of this fin is one-third that of the body. The second dorsal in its anterior part is twice as high as the first, and its length is twice its own height. It is composed of 2 hidden spines and 14 rays, and is followed by 4 finlets. The anal is similar to the second dorsal in position and size, is composed of 2 spines and 15 soft rays, and is followed by 4 finlets, the last of which looks as if it were double. The length of the pectoral is one-ninth of the total length. Ventral two-thirds as long as the pectoral. The head and the most of the body appear to be smooth, but toward the end of the tail some scales are visible. The lateral line is nearly straight, and formed of a series of little, serrated scales. Color silvery, a little darker on the back; the lateral line brown, fins gray, iris golden.

Radial formula: D. XVII, II, 14+IV; A. II, 15+IV.

The types of this species were sent to the Musée d'Histoire Naturelle from Brazil by Delalande, and were a foot in length. The species is undoubtedly an inhabitant of considerable depths.

THYRSITOPS VIOLACEUS, BEAN. (Figure 209.)

Thyrsitops violaceus, BEAN, Proc. U. S. Nat. Mus., 1887, pp. 513, 514.

A *Thyrsitops* with the body stout, its greatest width being exactly one-half of the height at the anal origin. The greatest height of the body is one-half of the length of the head, and is contained 8 times in the total length without caudal. The length of the head is one fourth of the standard length; its greatest width is contained 4½ times in its length. The width of the interorbital area is slightly greater than the length of the eye, which is contained nearly 7½ times in the length of the head and 3½ times in the length of the upper jaw. The least height of the tail equals the width of the interorbital area. The length of the snout equals twice the length of longest dorsal spine, and one-half the distance from the tip of the snout to the origin of the spinous dorsal. The maxilla extends to the vertical through the front of the eye. The length of the upper jaw equals 3¼ times the width of the interorbital space. The mandible reaches to the vertical through the hind margin of the eye; its length, including the fleshy tip, is 5 times the width of the interorbital area. The anterior nostril is smaller than the posterior; it is situated in advance of the eye one diameter of the eye. The posterior nostril is a narrow slit placed midway between the anterior and the eye. Strong teeth on the intermaxillary and mandible. Three large fangs anteriorly in the roof of the mouth; pseudobranchiae well developed; no trace of gill-rakers. The spinous dorsal begins at a distance from the snout which equals twice the length of the snout; it is highest in the middle. The ninth and thirteenth spines are slightly longer than the third spine and more than twice as long as the twentieth, their length equaling one-half that of the snout. The soft dorsal is highest anteriorly, its longest ray, the fifth, being nearly twice the least height of the tail. The caudal is forked; its middle rays about one-half as long as the external rays. The anal origin is under the third ray of the soft dorsal, its distance from the vent 2¼ times the length of the dagger-shaped spine. The vent is directly under the end of the spinous dorsal. The anal rays are longest anteriorly, the fifth ray being nearly as long as the corresponding ray of the soft dorsal. The dagger-shaped spine in front of the anal equals one-half the least height of the tail. The ventral is immediately under the third spine of dorsal; its first and longest ray equals three-fourths of the interorbital width. The fifth ray is about two-thirds as long as the first. The pectoral begins under the second dorsal spine; its length equals 2½ times the width of the interorbital area. It extends to the vertical midway between the fifth and six dorsal spines.

The lateral line is well developed; it descends gradually from the upper angle of the gill opening, reaching the median line of the body under the soft dorsal. The scales are irregular in shape, thin, elongate, cycloid, and deciduous.

Color, purplish. The spinous dorsal, pectorals, ventrals, and inside of mouth blackish.

Radial formula: D. xx, I, 19+2 finlets; A. 17+3 finlets; V. I, 5; P. 13.

TABLE OF MEASUREMENTS.

	Millimeters.		Millimeters.
Length to base of caudal (44 inches)	1,115	Length of twentieth dorsal spine	25
Greatest height of body	138	Length of fifth dorsal ray	78
Height at ventrals	126	Length of last dorsal ray	20
Height at anal origin	112	Length of second dorsal finlet	28
Least height of tail	40	Caudal, length of middle rays	58
Greatest width of body	56	Caudal, length of external rays	116
Length of head	280	Pectoral, from tip of snout	275
Greatest width of head	62	Length of pectoral	100
Width of interorbital area	40	Ventral, from tip of snout	285
Length of snout	117	Length of first ventral ray	30
Length of upper jaw	130	Length of fifth ventral ray	22
Length of mandible, with tip	203	Vent, from dagger-shaped spine	32
Length of mandibular tip	23	Length of dagger-shaped spine	20
Length of eye	37	Anal, from vent	45
Spinous dorsal, from tip of snout	233	Length of fifth anal ray	72
Length of third dorsal spine	55	Length of last anal ray	20
Length of ninth dorsal spine	58	Length of last anal finlet	28
Length of thirteenth dorsal spine	58		

The type (Cat. No., U. S. N. M., 39287) was received by the National Museum from Mr. W. A. Wilcox, agent of the U. S. Fish Commission at Gloucester, Mass., and was caught by Capt. Thomas Thompson, schooner *M. A. Baston*, on Le Have Bank, in 125 fathoms.

It is 44 inches long to the base of the middle caudal rays. It is more nearly related to *lepidopoides* than to any other species; in fact, it is not very closely related to any of the others. If we may trust the figures and descriptions of *T. lepidopoides* our new species has a larger number of dorsal spines and rays and a much smaller number of dorsal and anal finlets. *T. lepidopoides* is said to be uniform silvery, the back somewhat plumbeous and the fins gray. Our species is uniformly purplish brown, the spinous dorsal, pectorals, ventrals, and inside of the mouth blackish.

RUVETTUS, Cocco.

Ruvettus, COCCO, Giorn. Sci. Sicilia, XLII, 1829, 2.—GILL, Proc. Acad. Nat. Sci., Phila., 1862, 126.

Body fusiform and somewhat elongated. First dorsal with less than 25 spines. Spinous dorsal continguous to the soft, variable. Pectorals equidisant from the back and breast, or nearer the latter. Abdomen keeled. Tail not keeled. Ventrals I, 5. Dorsal and anal finlets developed. Dorsal and anal finlets 2. Lateral line obsolete. Skin with bony, oblique tubercles.

There have been two supposedly distinct forms described, one the *Ruvettus pretiosus* from the eastern Atlantic and the Mediterranean, and one, the *Thyrsites scholaris* of Poey, from Cuba. It is probable that Dr. Günther is right in believing them to be identical, although no one except Poey has examined this accidental form, and the two have never been placed side by side.

Ruvettus is no doubt similar in its habits to the closely-related *Thyrsitops*, which decends below the hundred-fathom line.

RUVETTUS PRETIOSUS, Cocco. (Figure 210.)

EL ESCOLAR.

Ruvettus pretiosus, COCCO, in Giornale di Scienze per la Sicilia, XLII, 1829, 21; Nuov. Giorn. Lett. Pisa, fasc. LXXIII.— BONAPARTE, Fauna Italica, Pesc., pl. XLII.—CAPELLO, Jorn. Acad. Sci., Lisbon I, 260; Cat. Peixes, Portugal, 1880, 16.—GILL, Proc. Acad. Nat. Sci., Phila., 1862, 126.—POEY, Synopsis, 363; Enumeratio, 74.—STEINDACHNER, Sitzb. Ak. Wiss. Wien., 1867, 102.

Thyrsites pretiosus, GÜNTHER, Cat. Fish. Brit. Mus. II, 1860, 351; Challenger Report, XXII, 268.—CANESTRINI, Pesci d' Italia, 189.—GIGLIOLI, Elenco, 84.

Tetragonurus simplex, LOWE, Proc. Zoöl. Soc., London, 1833, 143.

Aplurus simplex, LOWE, Trans. Zoöl. Soc., London, II, p. 180.

Rovetus Temminkii, CANTRAINE, Giorn. Sci. et Litt. Pisa, 1883 (fide Poey.)

Rovettus Temminkii, VALENCIENNES, in Webb and Berthelot, Poiss. Canar., 52, plate.

Acanthoderma Temminkii, CANTRAINE, Journ. Acad. Sci. et Belles-Lettres, Bruxelles, 1835, x, pl. I.

Thyrsites acanthoderma, LOWE, Proc. Zööl. Soc., London, 1839, 78.

Thyrsites scholaris, POEY, Memorias, Hist. Nat. Cuba, I. 1854, 372, pl. XXXII, fig. 1; 2–II, p. 16; Repertorio Fis. Nat. Cuba., II, 13.

A Scombroid, with elongate, fusiform, somewhat compressed body; its height is equal to one-sixth of its length (without caudal); the length of its head about one-fourth. Abdomen with a denticulated keel. Body covered with bony plates, remote from each other, and armed with spines. No lateral line. The maxillary extends beyond the vertical from the posterior margin of the orbit. First dorsal fin composed of 15 spines, 18 rays, and 2 separate finlets; the spinous portion received in a furrow. The second dorsal nearly similar and opposite. Two detached anal finlets. Caudal strongly forked, the upper lobe the largest. Color, above, blackish brown; below, dull white, the bony scutes being whitish in color.

Radial formula: D. XV+18+1+1; A. 17+1+1; P. 15; V. I, 5; C. 9+8; B. VII.

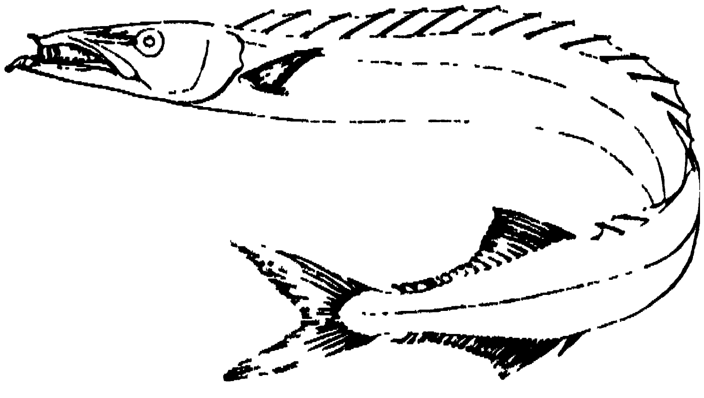
This form, first described from the Mediterranean, occurs about Sicily; here it is so rare at the present time that it does not appear to have a common name among the fishermen, though Canestrini says that its flesh is delicious. Bonaparte refers to it as *Rovetto*, and the fishermen of Catania call it *Pesci Ruvetto*. Dr. Anastasio Cocco first described it from Messina. Giglioli has observed it at Genoa, Naples, Palermo, Malta, and Spalato (Dalmatia) and at Nice. It was subsequently found by Lowe at Madeira, and by Webb and Berthelot at the Canaries. It occurs rarely on the Portuguese coast, where it is called *Escolar*, and doubtless also in Spanish waters. About the Canaries the fish is known as the *Escolar*, a name which is said to be applied to members of the family *Gadidæ* by Spanish fishermen. The Escolar occurs in great schools about the Canaries in winter, and the fishermén capture it with hook and line at a depth of a hundred fathoms or less, and its flesh is highly prized. Cantraine states that it is taken at considerable depths about Malta. Lowe found it at Madeira at depths as great as 300 and 400 fathoms. It was found by Poey in the waters of Cuba before 1854. Poey tells us that it is rarely seen in the markets because of the difficulty attending its capture, for it can be caught only at a depth of 300 fathoms on dark nights in September and the early part of October. Poey further states that when one of these fishes is brought to the surface it appears to be surrounded by a globe of phosphorescent light. The Cuban fishermen go "a scholaring" (*á escolarear*) after the fishing for the Spearfish (*Tetrapturus*) has ceased, and before that for the Red Snapper (*Lutjanus aya*) begins. According to Canestrini it grows to the weight of 100 pounds in Sicilian waters.

In 1891 a specimen (No. 43746, U. S. N. M.) 49 inches in length, was taken on Georges Bank, in about 41° 40′ N. lat., 67° 44′ W. long., in September. It was obtained by the schooner *M. A. Baston*, Capt. Thomas Thompson, of Gloucester, and was sent by the captors to the U. S. Fish Commission. Another individual, 6 feet long, was taken from the same region a few weeks later. This also was sent to the Fish Commission, and was transferred to the National Museum, where its skeleton is preserved.

NESIARCHUS, Johnson.

Nesiarchus, JOHNSON, Proc. Zoöl. Soc., London, 1862, 173.

Body elongate, compressed, covered with small scales. Eye of moderate size. Several strong fangs in the jaws; palate toothless. First dorsal fin with about 20 spines, separate from the second. No detached finlets. Ventrals small, thoracic. Caudal fin present. A dagger-shaped spine behind the vent.



NESIARCHUS NASUTUS

The only species is *N. nasutus*, obtained at Madeira in 1862, by Johnson, and which has since been captured in deep water off Portugal.

NESIARCHUS NASUTUS, Johnson.

Nesiarchus nasutus, JOHNSON, Proc. Zoöl. Soc. London, 1862, 173, pl. XXII.—GÜNTHER, Challenger Report, XXII, 1887, 37.
Prometheus paradoxus, CAPELLO, Jorn. Sc. Acad. Lisbon, I, p. 260, pl. IV, fig. 5; II, p. 154; Cat. Peix., Portugal, 1880, 16.—STEINDACHNER, Sitz. Ak. Wiss. Wien, 1887, 103.

Body very elongate, covered with small, deciduous, cycloid scales, conspicuously marked with concentric striæ; its height contained 13 times in its length. Head compressed, its flat cheeks covered with scales. A broad groove between the eyes and on the snout.

Length of head in total 4¾. Eye below the dorsal outline, its diameter contained 9½ times in the length of the head; the interorbital space slightly greater than the diameter of the eye. Length of snout 4¼ times the diameter of the eye; snout terminated by a large, conical, cartilaginous process, projecting far beyond the jaw. Mandible with a similar but longer cartilaginous process, these projections giving to the head somewhat the aspect of *Sphyræna*. Mouth large. Dorsal fin inserted in advance of the base of the pectorals, rising from a groove; its spines weak, distant and grooved, but not tuberculated; higher behind than in front. The second dorsal is separated from the first dorsal by a distance equal to about one-fifth of the length of the head; the second dorsal is high, subtriangular in front, its fourth and fifth rays the longest; the last 4 or 5 rays are short and much branched, the last being elongated. Anal preceded by a stout, broad, two-edged spine, placed opposite, similar in shape to the second dorsal. Pectorals pointed, inserted in the median line of the body. Ventrals thoracic, close together, slightly behind pectorals; small, composed of a spine and 4 soft rays, the length of the first and longest ray one-eleventh that of the head. Caudal well developed, furcate, very broad below. The lateral line descends from the shoulder to the middle of the body, thence straight to the caudal. Color, plumbeous, with black fins; peritoneum black.

Radial formula: D. XX, 21, II; A. I, 22; P. 13; V. 14; B. VII.

A single specimen, 36½ inches in length, was taken in April, 1862, off the coast of Portugal. It was again taken by Capello off Lisbon and Setubal in October, 1877. Capello says that though very rare it is known to the Portuguese fishermen, who do not distinguish it from *Aphanopus carbo*, calling them both by the common name, *Peixe espado preto*.

EPINNULA, Poey.

Epinnula, POEY, Mem. Hist. Nat. Cuba, I, 1854, 369, 371.—GÜNTHER, Cat. Fish. Brit. Mus., II, 349.—GILL. Proc. Acad. Nat. Sci., Phila., 1862, 126.

Body fusiform and moderately elongated. First dorsal with less than 25 spines. Spinous dorsal continuous with the soft. Pectorals equidistant from the back and breast, or nearer the latter. Tail not keeled. Ventrals, I, 5. No finlets. Lateral line present, double.

EPINNULA MAGISTRALIS, POEY. (Figure 211.)

Epinnula magistralis, POEY, Mem. Hist. Nat. Cuba, I, 1854, 369, pl. XXXII, figs. 3, 4; Syn. Pisc. Cubensium, 364: Enumeratio Pisc. Cubens, 75.—GÜNTHER, Cat. Fish. Brit. Mus., II, 349.—GILL, Proc. Acad. Nat. Sci., Phila., 1862, 126.

A Scombroid with body subfusiform, somewhat compressed. Scales minute, delicate, deciduous. Vertical fins scaleless. Ventral fins behind the pectorals. Upper maxillary extends to below the middle of the orbit. Operculum with an obtuse angle. Dorsal and anal nearly equal in length, but the anal somewhat the shorter. Caudal furcate, the lower lobe the smaller. Ventral under the lower angle of the pectoral. Coloration bluish, lighter on sides and belly, fins reddish brown, dorsal opalescent, iris white.

Radial formula: D. XV, I, 16; A. III, 13. V. I, 5; P. I-14; C. 8 + 7; B. VII; Pyloric cæca, 10.

Poey's *Epinnula magistralis* was known from a single specimen, 980 millimeters long, obtained at Havana in September, 1853. It was not known to the fishermen, and nearly forty years have elapsed since its capture. Everything would seem to indicate that it is a dweller in the depths of ocean adjacent to Cuba.

The *Albatross* obtained a specimen (U. S. N. M., No. 37238), in the Caribbean Sea in 1885.

NEALOTUS, Johnson.

Nealotus, JOHNSON, Proc. Zoöl. Soc., London, 1865, 434 (type, *N. tripes*, Johnson).

Body elongate, much compressed, incompletely covered with delicate scales. Cleft of the mouth deep. Small teeth in the jaws and on the palatine bones; none on the vomer.

First dorsal (composed of about 20 spines) continuous, extending to the second; finlets behind the dorsal and anal; a dagger-shaped spine behind the vent. No keel on the tail. Caudal fin well developed. Ventrals reduced to a spine each. Seven branchiostegals.

NEALOTUS TRIPES, JOHNSON.

Nealotus tripes, JOHNSON, Proc. Zool. Soc., Lond., 1865, 434.—GÜNTHER, Challenger Report, XXII, 1887, 35.

Body very elongate, with a few large, deciduous, simple scales of delicate structure here and there upon its surface.

The height of the body is contained 9⅓ times in its length; the length of the head 4⅓ times. Head flattened above, concave in the interorbital region, with four low ridges, the inner pair of which inclose an elongate, diamond-shaped space; lower jaw longest.

Eye round, lateral, its diameter equal to one-fifth of the length of the head; length of the snout is 1⅔ times the diameter of the eye; opercle with two obtuse projections behind, separated by a notch.

Spinous dorsal inserted in front of the root of the pectoral, its height slightly greater than half that of the body; its length less than half that of the body; placed in a groove, supported by twenty-one simple slender spines; the second dorsal is placed close behind the first, not so high and less than half as long, with nineteen rays, and followed by two finlets.

The pectoral origin is under the angle of the opercle; its length is equal to that of the second dorsal fin. The spines representing the ventrals are inserted close together under the hinder part of the roots of the pectorals; their length about one fourth of the height of the body. These spines are longitudinally grooved, and each appears to consist of two or three spines coalesced together.

Vent very slightly postmedian; a flat, dagger shaped spine, longitudinally grooved, half as long as the height of the body, inserted close behind the vent. The anal fin is inserted behind this spine at a distance about equal to its length, and is opposite to, but rather shorter than the second dorsal. Caudal fin deeply furcate.

The lateral line descends obliquely from above the opercle to the middle of the length of the fish, and then continues with a gentler obliquity along the posterior part of the body to the tail, where it is inserted at one-third of the distance from the ventral to the dorsal outline.

Radial formula: D. XXI | 19 | II; A. 18 | III; P. 13; V. I.

This species closely resembles *Promethichthys atlanticus*, from which it may be distinguished by the dagger-shaped spine in front of the anal fin, by the greater number of spines in the first dorsal—21 instead of 18—by the smaller number in the second dorsal—19 instead of 21—and by the longer anal, which has 18 instead of 16 spines. It also has the ventral spines under the posterior angle of the pectorals, instead of in advance of them, and has its lateral line descending more gently.

From *Nesiarchus* it is distinguished by its ventral fins and by the absence of the cartilaginous prolongations of the jaws.

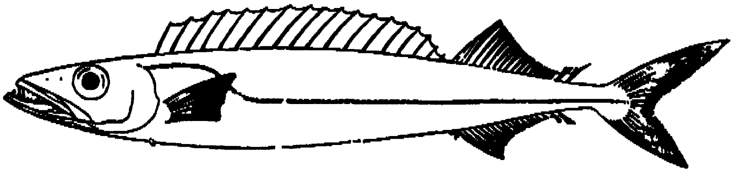
"This fish," remarks Günther, "was known from a single example, 10 inches long, obtained at Madeira in the month of December, and has been fully described by Johnson. The *Challenger* collection contains a very young specimen, only 33 millimeters long, which agrees so well with Johnson's description that it no doubt belongs to the same species. Only the dagger-shaped postanal spine is shorter than the ventral spines, and also the separation of distinct finlets can not be clearly made out, as might be expected in so young an example. It was brought up in the dredge at *Challenger* station 40, in lat. 34° 51′ N., lon. 68° 30′ W., where the dredge had reached a depth of 2,675 fathoms. However, no part of the organization of these Trichiuroids indicates that they descend to so great a depth, whilst, on the other hand, young Trichiuroids are not rarely found near the surface. It is, therefore, much more probable that this small fish entered the dredge shortly before it came to the surface." (*Günther.*)

PROMETHICHTHYS, Gill.

Prometheus, LOWE, Trans. Zoöl. Soc., London, II, 181; Proc. Zoöl. Soc., London, 1839, 78; Fishes of Madeira, 141.—GILL, Proc. Acad. Nat. Sci., Phila., 1862, 126.
Promethichthys, GILL, Mem. Acad. Nat. Sci., VI. 1893.

Scombroids with elongate, slender, fusiform body, long spinous dorsal, pectorals comparatively low, caudal without keels, ventrals represented by a pair of minute spines, finlets above and below, two in number, no dagger-shaped spine behind vent. Preoperculum unarmed. Lateral line descending in strongly oblique line, below the front of the spinous dorsal.

PROMETHICHTHYS PROMETHEUS (C. & V.) GILL.



THE BERMUDA CATFISH.

Gempylus prometheus, WEBB and BERTHELOT, Poissons, Iles Canar., 51, pl. XI.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, 213, pl. 222 (Saint Helena, Quoy and Gaimard).
Thyrsites prometheus, GÜNTHER, Cat. Fish. Brit. Mus., II, 351; Challenger Report, XXII, 1887, 268. (Madeira, Rev. R. T. Lowe.)—GOODE, Amer. Jour. Sci., XIV, 1877, 291 (occurrence in Bermuda).
? *Gempylus prometheus*, CUVIER and VALENCIENNES, *op. cit.*, 213, pl. 222.
Prometheus atlanticus, LOWE, Trans. Zoöl. Soc. London, II, 181; Proc. Zoöl. Soc., 1839, 78; Fishes of Madeira, I, 141, pl. XX.—GILL, Proc. Acad. Nat. Sci. Phila., 1862, 126.—POEY, Synopsis, 364; Enum. Pisc. Cubensium, 74.
?*Gempylus Solandri*, CUVIER and VALENCIENNES, *op. cit.*, 215 (on description by Solander of individual 3 feet long from New Holland).
Promethichthys atlanticus, *Gill. loc. cit.*

Height of body one-eighth of its total length; length of head two-ninths. Lateral line curves downward under origin of first dorsal. Ventral represented by a single spine in advance of the pectoral.

Radial formula: D. 18 | 21+II (III); A. 16 | II (III); V. 1.

Color, silver gray, the spinous dorsal darker.

This fish, the "Coelho" or Rabbit Fish of Madeira, lives habitually at the bottom, and is taken at most seasons at a depth of from 100 to 300 or 400 fathoms, and in the summer months, according to Lowe, it is generally one of the commonest and cheapest fishes in the market, where it is sold in bundles, chiefly to the Portuguese. It breeds in August and September, and attains a length of 30 millimeters.

Several specimens were obtained in Bermuda in 1877 by Dr. Goode. The fishermen obtain it at a depth of 60 to 100 fathoms, and it is known to them as the "Catfish."

DICROTUS, Günther.

Dicrotus, GÜNTHER, Cat. Fish. Brit. Mus. II, 1860, 349. (Type, *D. armatus*.)

Body rather elongate, compressed; cleft of the mouth wide. The first dorsal continuous, with the spines of moderate strength, and extending on to the second; finlets none. Ventral reduced to a long, crenulated spine. Preoperculum with several spines at the angle. Body naked. Several strong canines in the jaws; minute teeth on the vomer and the palatine bones. No keel on the tail. Seven branchiostegals. Pseudobranchiæ.

The fishes assigned to this genus are always small. They will perhaps prove to be the young of *Prometheus* or *Gempylus*.

DICROTUS ARMATUS, GÜNTHER.

Dicrotus armatus, GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, 349.

The height of the body is 6½ in the total length, the length of the head 3⅕ The maxillary reaches to below the anterior margin of the eye; preoperculum with two spines at the angle; operculum terminating in two obtuse points, separated by a notch. The dorsal spines are of moderate strength, and tubercular; the second to the fifth are the longest, and as high as the body; the posterior ones gradually decrease in length; caudal forked; anal spines short; pectoral of moderate length. Each ventral spine is inserted in advance of the pectoral; it is tubercular, very long, its length being equal to the height of the body. The vent is situated far backwards, and its distance from the head is more than the length of the latter. Scales apparently none; lateral line bent downwards anteriorly. Uniform silvery.

Radial formula: D. 18 | 18; A. $\frac{2}{18}$; V. 1.

The specimen described by Günther is only 2⅛ inches long, and apparently young.

DICROTUS PARVIPINNIS, Goode and Bean, n. s. (Figure 212.)

The steamer *Albatross* captured several examples of a species of *Dicrotus* in the western Atlantic. One at station 2537, N. lat. 39° 56′ 45″, W. lon. 70° 50′ 30″; another at station 2542, N. lat. 40° 00′ 15″, W. lon. 70° 42′ 20″, and a third at station 2691, N. lat. 34° 39′ 15″, W. lon. 75° 33′ 30″ off Cape Hatteras. The first two were obtained in excursions off Newport, R. I. The example from station 2601, measuring nearly 1 inch in length, is referred to in the description, the other two not being at the present time accessible to us. We are led to refer this individual to the genus *Dicrotus* because of the absence of a dagger-shaped spine behind the vent and because of the similarity in the number of dorsal spines. we assume that *Dicrotus* of Günther is the young of *Promethichthys atlanticus*. Our species resembles very strongly the illustration by Dr. Lütken, in "Spolia Atlantica" of *Nealotus tripes*, and as there is no indication of the presence of a dagger shaped spine even in an example of nearly 1 inch in length we can not believe that our individual belongs to *Nealotus;* it possesses the characters of *Dicrotus* much more nearly and we shall refer to it under that name. The length of the individual described is 21 millimeters to the base of the caudal. The greatest height of the body (3½ millimeters) is contained 6 times in the standard length. The least height of the tail is one-half the length of the eye. The length of the eye is one-half the length of the postorbital part of head and somewhat more than one sixth of the total length of the head. The length of the head (9 millimeters) is contained 2⅓ times in the standard length. The upper jaw reaches to the vertical from the front of the orbit, and the lower jaw to below the beginning of the postorbital third of the orbit. The nostril is placed in front of the eye a distance equal to two thirds the length of the eye. Three large fangs in the upper jaw, a large fang near the tip of the lower jaw, and 8 smaller teeth. Three weak diverging spines on the border of the preoperculum. The dorsal originates at a distance behind the eye about equal to one and one-half times the length of the eye, or about over the middle of the operculum. The spines are all serrated; the first five are about equal, their length nearly equal to that of the postorbital part of the head; they diminish gradually in size from the fifth, and the last is only about one half as long as the eye. The longest ray is scarcely more than two thirds as long as the eye. The anal origin is under that of the soft dorsal. The length of the anal base is about one half that of the snout. The soft dorsal base is not much longer than the anal base. The first anal spine is one-third as long as the eye; the second spine is one third as long as the soft dorsal base. The longest anal ray is two-thirds as long as the eye. The ventral origin is under the sixth spine of the dorsal; the spine is strongly serrated; its length equal to that of the ninth dorsal spine, slightly more than one-eighth of the standard length. The ventral contains, also, either a single bifid ray or two simple rays. The pectoral origin is under the third spine of the dorsal. The length of the fin is one-fourth the length of the head. The caudal is moderately forked; the middle rays one-half as long as the snout and about two thirds as long as the external rays.

Radial formula: D. xxi, 11; A. ii, 8; P. 12; V. i, 1, or i, 2.

Color silvery; caudal peduncle and top of back at base of dorsal brownish.

Subfamily GEMPYLINÆ.

Scombridæ with very elongate, compressed body, and elongate, spinous dorsal, which is continuous with the second dorsal. Caudal not carinate. Pyloric cæca few.

In this subfamily is a single genus and a single species.

GEMPYLUS, CUVIER and VALENCIENNES.

Gempylus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, 207.

Scombroidea with very elongate, slender, compressed body. Scales almost absent. Spinous dorsal very long, with thirty or more spines, continuous with the second; six finlets above and below. Ventrals minute, almost rudimentary. Caudal not keeled. Several strong teeth in the jaws. Pyloric cæca not numerous.

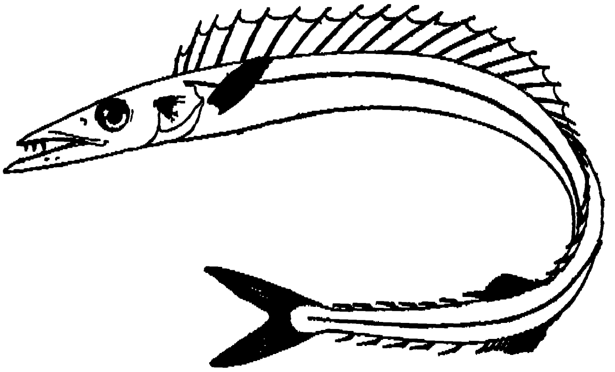
GEMPYLUS SERPENS, CUVIER and VALENCIENNES.

Scomber serpens, SOLANDER, MSS.

Gempylus serpens, CUV. and VAL., Hist. Nat. Poiss., VIII, 207 (Antilles, from M. Plée).—CUVIER, Règne Animal, Ill., Poiss., Pl. XLIX, Fig 2.—GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, 350; Challenger Report, XXII, 1887, 41, and in Garrett's *Fische der Südsee*, Hamburg, 1873, I, 106, Taf. LXVIII, Fig. B.

Gempylus coluber, CUVIER and VALENCIENNES, *loc. cit.*, 211. (Otaiti, coll. by Garnot and Lesson.)

Lemnisoma thyrsitoides, LESSON, Voyage Coquille, Poiss., 160.



GEMPYLUS SERPENS.

A *Gempylus* with the ventrals reduced to a pair of very small spines. The height of the body is contained from 15 to 17 times in its own length; the length of the head from 5 to 5½ times in the same distance. Body scaleless. Color uniform, the upper part of the dorsal fin black.

Radial formula: D. XXX–XXXI, 12–13, VI; A. III, 12, VI.

Pyloric cæca, 9–10.

Günther considers all known forms of this genus as belonging to a single species, including *G. coluber*, C. & V., the Pacific form, which he has figured in his *Fische der Südsee*, pl. LXVIII, fig. B. It has been rarely obtained at the Canary Islands, in the Caribbean Sea, and near the Society and Sandwich Islands. It is generally believed to be an inhabitant of great depths.

Family LEPIDOPIDÆ.

Lepidopodidæ, GILL, Standard Natural History, III, 1885, 206.

Lepidopidæ, GILL, MS.

Scombroidea with elongate band-shaped bodies, a continuous or subcontinuous long dorsal, a comparatively short anal, preceded by a considerable number of short detached spines, no finlets, and a distinct forked caudal. Pectorals with some inferior rays longest. Ventrals rudimentary or absent. A spine, or scute, or pair of scutes behind the vent. Scales absent. Lateral line conspicuous, sinking rapidly anteriorly. Teeth lanceolate in jaws, sometimes larger in front. No teeth in palatines. Air bladder present. Gill membranes separate, free from isthmus. Gills four, with a slit behind the fourth. Abdominal and caudal vertebræ numerous. Pyloric cæca in large numbers.

KEY TO THE GENERA OF LEPIDOPIDÆ.

I. Dorsal continuous. Teeth on palatines. Ventrals present, scale-like, rudimentary. No post-anal spine

- A. Body high. Head with crest. Teeth in jaws lanceolate in single rows. Pectorals broad, furcate. Ventrals inserted considerably behind pectorals.
  - 1. Head rather long, with lateral occipital crests converging anteriorly. Orbit near to profile. Maxillary curved and upper jaw shorter than lower.......................... LEPIDOPUS
  - 2. Head rather short, high, compressed above into a trenchant edge. Profile convex, declivous, far from orbit. Mouth somewhat oblique. Maxillary straight. Jaws equal.... EVOXYMETOPON
- B. Body low. Head crestless. Anterior teeth long, compressed, posterior ones acicular; a few minute teeth outside of anterior long ones. Pectorals slender, rounded. Ventrals under root of pectorals.
  - 1. Head rather long, depressed, with orbits encroaching upon profile. Maxillary curved. Lower jaw projecting.. BENTHODESMUS

II. Dorsal in two subequal portions, closely contiguous. No teeth on palatines. Ventrals absent. A dagger-like post-anal spine .... APHANOPINI.

- A. Head long, pointed. Eye very large, not close to profile. Upper jaw slightly curved, lower slightly projecting.. APHANOPUS

LEPIDOPUS, Gouan.

Lepidopus, GOUAN, Historia Piscium, 1770, 185.—CUVIER and VALENCIENNES, Hist. Nat. Poiss. VIII, 218.—GÜNTHER, Cat. Fish. Brit. Mus. II, 1860, 342; Challenger Report, XXII, 1887, 37.

Vandellius, SHAW, Zoölogy, IV, p. 199.

Ziphotheca, MONTAGU, Wern. Mem., I, 82, Pls. II–III; II, 432.

Body very elongate, band-like, scaleless; head pointed, with lateral occipital crests converging anteriorly; cleft of the mouth wide, the jaws being armed with strong lanceolate teeth in a single series, larger ones in front; a series of minute teeth on the margins of the palatines. Nodules oblique. Eyes large. Along the whole of the back one single dorsal fin; anal spines numerous, but minute or hidden beneath the skin; no post-anal spines; caudal well developed; ventral fins rudimentary, inserted behind the pectorals. Two post anal scutes. Eight branchiostegals; air-bladder present. Pyloric cæca somewhat numerous. Type, *Lepidopus Gouani*, Bl.

LEPIDOPUS CAUDATUS, (EUPHRASEN), WHITE. (Figure 213.)

Trichiurus caudatus, EUPHRASEN, Stockh. K. Vet. Acad. Nya. Handl., 1788, IX, 52, Tab. 9, Fig. 2.

Lepidopus caudatus, WHITE, List of Brit. Fishes, 1851, 32.—GÜNTHER, Cat. Fish. Brit. Mus. II, 344 (with extended synonymy).

Height of the body 15½ in the total length, the caudal deeply forked. Anal spines in great number—minute, if visible. Color, uniform silvery.

Radial formula: D. 102–104; A. 24–5.

Cæc. Pylor. 23. Vertebræ 41+71. (Günther.) This form has been taken many times during the century, from Norway to South Africa, and the Mediterranean. It evidently lives at considerable depth and comes rarely to the surface. It has not been found in the Western Atlantic. A specimen was obtained by John Xantus de Vesey at Cape St. Lucas, and the species is also known as the "Frost-fish," about Tasmania and New Zealand, where, according to Lendenfeld, it occurs periodically in great numbers, evidently coming up from the depths to deposit its spawn near the shore.[1]

EVOXYMETOPON (Poey) Gill.

Evoxymetopon, (POEY,) GILL, Proc. Acad. Nat. Sci., Phila., 1863, 228.

Body very elongate, band-like; head with the supraocular portion compressed into a trenchant edge, and the upper profile abruptly descending towards the end of the snout; eye of moderate size, much below the upper profile. Cleft of the mouth wide; teeth lanceolate, in single rows, with larger ones in front; a series of small teeth on the palatines. Fins as in *Lepidopus*. (*Günther.*)

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[1] Zoölogischer Anzeiger, 1883, 559.

EVOXYMETOPON TÆNIATUS, Poey. (Figure 214.)

Evoxymetopon tæniatus, (Poey,) Gill, Proc. Acad. Nat. Sci., Phila., 1863, 228; Ann. Soc. Esp. Hist. Nat., II, 1873, 77, Pl. V.

The greatest height equals about a twelfth of the extreme length, while the head forms about an eighth of the same. The head is oblong, trenchant above, elevated above the eyes for a space considerably greater than the diameter of the eye, and decurved very obliquely downwards to the snout. The diameter of the orbit enters about 6 times in the head's length. The first ten dorsal spines are undivided; the rest split.

Radial formula: B. 7; D. 87; A. 19; C. 17; P. 12.

The color is silvery, with about six narrow reddish bands most distinct behind, the first on the ridge of the back and the fifth along the lateral line. (*Poey.*)

The following table indicates the relative proportions of the *Evoxymetopon tæniatus*.

MEASUREMENTS.

	Millimeters.
Extreme length	100
Body:	
Greatest height	8
Height at anus	6¼
Height of tail between anus and caudal fin	5
Least height of tail	½
Head:	
Greatest length	12
Distance from snout to nape	7
Length of snout	4¼
Length of operculum	4½
Length of lower jaw	5
Orbit:	
Diameter	2
Distance from profile	2½
Dorsal:	
Height at first spine	3
Height at second spine	3¾
Height at ray above anus	1¾
Height at ray between anus and caudal	1¼
Caudal:	
Length of external rays	3¼
Pectoral:	
Distance from snout at upper axilla	14
Length	6¼
Ventral:	
Distance from snout	17½
Length	2¾

A specimen obtained by Poey at Havana was presented by him to the National Museum (No. 5735), and a figure of it is here given.

Evoxymetopon Poeyi, Günther, from the Mauritius is a very closely related form.

BENTHODESMUS, Goode and Bean.

Benthodesmus, Goode and Bean, Proc. U. S. Nat. Mus., IV, 1881, 380, Pl. II. (type, *Lepidopus elongatus*, Clarke.)—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 910.

Body naked, much compressed, attenuate, tapering gradually from vent to base of caudal. Caudal peduncle very slender, supporting a small but well developed caudal fin. Vent considerably nearer to head than to tail. Lateral line simple, in a deep, wide furrow, nearly straight, in front of the vent gradually ascending to the scapular region.

Head compressed, its upper profile nearly horizontal; snout gibbous near its end, as in

Lepidopus. Top of head very flat, concave between the eyes, with no occipital crest. Interorbital ridges not elevated. Eyes large, slightly postmedian. Operculum oblong, reaching a little beyond the base of the pectoral fin. Nostrils horizontal, in front of the eyes. Supramaxillary not extending to vertical from front of eyes. Lower jaw with stout cutaneous appendage.

Three very long, simple, compressed teeth on each intermaxillary in front; outside of these a few minute teeth, and behind them a row of large acicular teeth. In lower jaw a single row of moderately large acicular teeth, more numerous than in the upper jaw, largest in the middle of the jaw. Palatine teeth minute.

Dorsal fin, beginning above the operculum, nearly uniform in height throughout its entire length, and continuous almost to the caudal. Rays very numerous (over 150 in *B. elongatus*). Anal beginning near the vent, preceded by a single scale-like appendage; spines very numerous (numbering with the rays about 100 in *B. elongatus*, all except 28 or 30 being spines), minute and almost hidden; a short fin posteriorly.

Caudal small, normal, forked. Pectoral inserted almost horizontally, with lower rays longest, and its upper outline rounded. Ventral fins represented each by a minute scale-like spine, inserted below the origin of the pectorals.

Pseudobranchiæ present; gills 4, a slit behind the fourth. Gill-rakers short and spiny, in a single series on the first and second arches, almost obsolete on the third and fourth. (In *Lepidopus caudatus* all the arches are supplied with several series of rakers.)

Benthodesmus may be distinguished from *Lepidopus* and *Evoxymetopon* by the following salient characters:

1. The slenderer, lower form of the body, the height of which in *B. elongatus* at the vent is one-fourth the length of the head; in *Lepidopus caudatus*, nearly half the length of the head.

2. In the location of the vent, which is considerably nearer to the head.

3. In the depressed form of the head, its flat profile, the insignificance of the frontal ridges, and the absence of the occipital crest.

4. In the much greater number of dorsal rays.

5. In the more advanced position of the rudimentary ventrals, which are situated in *Benthodesmus* under the base of the pectorals.

6. In the presence of a single small postanal scute, in place of the two larger ones in *Lepidopus.*

10. In the characteristic arrangement of the gill-rakers.

BENTHODESMUS ATLANTICUS, GOODE and BEAN, n. s. (Figure 215.)

Benthodesmus elongatus, GOODE and BEAN, Proc. U. S. Nat. Mus., IV, 1881, 380-3, Figure.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 910.—JORDAN, Cat. Fish. N. A., 1885, 67.

Body attenuate, its height at the vent contained four times in length of head, its width being about one-third of its height at the point mentioned. Length of caudal peduncle half of greatest height of body. Least height of tail one-third width of interorbital area.

Length of head contained seven and a half times in length of body, its greatest width one-sixth of its length; its greatest height nearly one-fourth of its length; width of interorbital area (on the bone) one-fourth of the height of the head. Length of snout contained 2½ times in length of head. Upper jaw not reaching to vertical from anterior margin of eye, and equal in length to the postorbital portion of head. Lower jaw in length equal to about twice the greatest height of body. Mandibular tip nearly one-third as long as the diameter of the eye. Eye slightly postmedian in location, the orbital diameter equal to half the length of the snout.

Besides the three long teeth, there are on each intermaxillary 8 or 9 of moderate size; on one side many small intermediate teeth are present. The number of teeth in the lower jaw varies from 13 on the one side to 21 on the other.

The first branchial arch has 13 gill-rakers, the longest of which measures about 2 millimeters. The second arch has about the same number, while on the third there are but 6 or

7, very small, and present only in the angles, while in the fourth there are about the same number, very inconspicuous.

The dorsal fin originates above the middle of the operculum, and at a distance from the snout equal to twice the length of the snout.

The anal fin is composed of about 100 spines and rays. Owing to the mutilation of the specimen it is impossible to determine how many there are of each, but there are supposed to be about 28 rays, normally united by a membrane into a fin.

The caudal is also imperfect, but the middle rays are seen to be about half as long as the remnants of the external rays. The fin is supposed to resemble in shape that of *Lepidopus caudatus.*

The pectoral originates under the tip of the opercular flap. Its outline is rounded above instead of emarginate, as in *Lepidopus caudatus.* Its longest ray equals in length the postorbital part of the head.

The ventrals originate at a distance from the snout equal to that of the base of the pectorals from the same point. They are rudimentary and represented by minute scutes, the length of which is 3½ millimeters in the specimen before us, and about equal to half the interorbital width.

Radial formula: D. 154: A. 100; P. 12; V. I.

Cæcal appendages 8, in the specimen examined. Some, however, may have been lost, the abdominal viscera having been partly digested by the halibut in the stomach of which it was found.

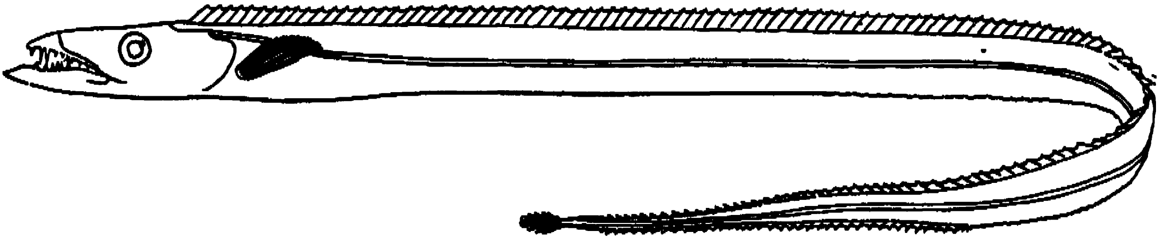
Color, uniform silvery, with traces of dark color upon head and tail.

The type of this description, a remarkable fish, taken from the stomach of a halibut caught on the western edge of the Grand Bank of Newfoundland in 80 fathoms, was received in 1887 from Capt. Roderick Morrison, of the Gloucester fishing schooner *Laura Nelson.*

Extreme length of type (No. 29116), 896 millimeters (35½ inches.)

A specimen was taken by the *Albatross* at station 2362, at a depth of 25 fathoms, and another by the *Blake* at station VII, off St. Kitts, in 208 fathoms.

B. elongatus was first obtained by Mr. Clarke, who thus describes its capture:



BENTHODESMUS ELONGATUS.

Collected by self, Hokitika beach, October 12, 1874, and the only perfect specimen of some eight or ten which have come under my observation. All were in the same proportion as the one above described, and varied but little in size, but were generally much mutilated by attrition on the sand and shingly beach.

Besides the type of the genus, *Benthodesmus elongatus*, Clarke, known from New Zealand, there is a Japanese species *Benthodesmus tenuis*, (Günther), from Inosoma, Japan,[1] taken by the *Challenger* in 345 fathoms, at station 232.

APHANOPUS, Lowe.

Aphanopus, LOWE, Proc. Zool. Soc., London, 1839, 79. (Type, *A. carbo,* from Madeira.—GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, p. 342; Challenger Report, XXII, 1887, 36.

Body very elongate, band-like, scaleless; head long, pointed; cleft of the mouth very wide, jaws armed with strong, lanceolate teeth arranged in single series and in common alveolar groove; no teeth on palatine; eye very large; back occupied by a long dorsal fin, divided in two subequal parts. Anal spines numerous and feeble; a dagger-shaped spine behind the vent. Caudal well developed, deeply cleft; pectorals moderate, rounded; ventrals absent; branchiostegals seven; air-bladder present. Pyloric appendages few.[1]

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[1] *Lepidopus tenuis,* GÜNTHER, Annals Magazine of Natural History, London, XX, 1877, 437; Challenger Report, XXII, 1887, 37, pl. VII, fig. B. (Type 24 inches long, from Inosoma, Japan.)

APHANOPUS CARBO, Lowe. (Figure 216.)

Aphanopus carbo, LOWE, Proc. Zool. Soc. Lond., 1839, 79.—GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, 343 (with description of skeleton).—Challenger Report, XXII, 1887, 37, pl. VII, fig. A.—CAPELLO, Jorn. Sci. Acad., Lisb., vol. I, tab. IV, fig. 4.

This species has never been described, except in so far as its characters are included in that of the genus. Lowe's original statement concerning it was as follows:

Of this most curious new genus a single individual only has yet occurred. The whole fish is of a dark coffee color, approaching to black ('uniform black,' says Günther), and has in form so close a general resemblance to *Lepidopus argyreus*, that it might well be taken hastily for a mere variety of that fish.

It has been obtained only from Madeira and the coast of Portugal, where specimens 4 or 5 feet long have, in rare instances, as stated by Capello, been caught on the long lines used by the fishermen for the capture of deep-sea sharks.

"We have no information," writes Günther, "as to the exact depth at which this fish lives, but there is no doubt that it belongs to the deep-sea fauna. The large eye, the black color of the body, and the thinness of the bones of the head and of the vertebræ, are additional evidence of the bathybial habits of the fish."

APHANOPUS MINOR, Collett.

Aphanopus minor, COLLETT, Vidensk. Selsk. Forhandl. Christiania, 1886, No. 19, 3.

A single specimen of a silvery-gray species of *Aphanopus* was taken July 4, 1886, off the east coast of Greenland, lat. 65° N., lon. 31° W., by Captain Pedersen, of Sandefjord, Norway, who placed it in the University Museum at Christiania.

The following is Collett's diagnosis:

Dark silvery or steel-colored. The length of the head is about 2⅔ in the length of the body to the vent; diameter of the eye about 4½ in the length of the head; 8 long teeth in the intermaxillary, the two foremost "canines" the longest; 8 teeth in the lower jaw, a trifle shorter; no teeth in vomer and the palatine bones. Ventrals, none; a strong dagger-shaped spine behind the vent. Air-bladder present; appendices pyloricæ, 7.

Length from tip of snout to the vent (in the single specimen examined) 352 millimeters.

Radial formula: D. 41. + ?; A?; B. VII.

MEASUREMENTS.

	Millimeters.		Millimeters.
Snout to vent	352	Length of intermaxillary	57
Length of head	131	Length of mandible	82
Length of head to tip of snout	126	Greatest height of body	48
Greatest height of head (above the eyes)	38	Height of body at anus	40
Eye to tip of under jaw	57	Distance of vent from anal fin	16
Length of snout	53	Distance of eye from nostril	8
Diameter of eye	27	Length of pectoral	50
Postorbital part of head	46		

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[1] The following is Lowe's diagnosis, as published in 1839: "Form as in *Lepidopus*, elongate, much compressed, like a sword blade, naked, but with a short keel on each side toward the tail. Muzzle and teeth as in *Lepidopus* (Gouan), but the palatines unarmed. Dorsal fins 2, nearly equal. Anal fin as in *Lepidopus* (but with a strong, sharp spine instead of a scale before it), a little behind the vent. No trace or rudiment of ventral fins."

Family TRICHIURIDÆ.

Trichiurini, BONAPARTE, Catalogo Metodico, Pesci Europei, 1846, 78 (Subfam. 136).

Trichiuroidei, BLEEKER, Enum. Spec. Pisc. Arch. Indico, 1859, 64.

Trichiuridæ, GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, 342.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 224; Arr. Fam. Fish. 1872, 8 (No. 77); Standard Nat. Hist. III, 1885, 206.

Scombroidea, with very elongate, compressed, scaleless body, tapering to a point, and without caudal. Dorsal and anal long, low, continuous, confluent posteriorly. Pectorals normal. Ventrals absent or rudimentary. Mouth wide; jaws armed with very strong, unequal teeth. Lateral line present. Air bladder present. Gills 4, with a slit behind the fourth. Gill membranes separate, free from the isthmus.

In addition to the typical genus *Trichiurus*, characterized by the absence of ventrals, there is a Chinese form, *Eupleurogrammus* (with a single species, *E. muticus*), in which the ventrals are represented by a pair of very small scales.

TRICHIURUS, Linnæus.

Trichiurus, LINNÆUS, Systema Naturæ, Ed. x, 1, 246; Ed. XII, I, 429.—CUVIER, Régne Animal, Ed. 1, 1817, 246; Ed. 2, 1829, 218.—CUVIER and VALENCIENNES, Hist. Nat. Poiss, VIII, 235.—GÜNTHER, Cat. Fish. Brit. Mus. II, 316.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 212.

Lepturus, ARTEDI, Spec. Pisc., 101.—GILL, Proc. Acad. Nat. Sci. Phila., 1862, 120.

Body very elongate, band-like, tapering to a fine point. Head long; cleft of mouth wide; teeth very strong and unequal in the jaws; teeth on the palatines, none on the vomer. Preorbital covering cleft of mouth posteriorly. A single dorsal along whole of back; anal very long, of short detached spines, minute or hidden in the skin; ventral fins reduced to scale-like appendages or absent; pectorals small. No caudal. No scales. Lateral line decurved, concurrent with the belly. Vertebræ, 39+120. Color, silvery.

TRICHIURUS LEPTURUS, LINNÆUS. (Figure 217.)

THE SCABBARD FISH.

Trichiurus lepturus, LINNÆUS, Syst. Naturæ, ed. x, 1758, I, 246. GÜNTHER, Cat. Fish. Brit. Mus., II, 346; Challenger Report, VI, 66; XXII, 39.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 422.

Trichiurus argenteus, SHAW, Zoölogy (Fishes), IV, 90, pl. XII.

Lepturus argenteus, GILL, Proc. Acad. Nat. Sci., Phila., 1862, 126.

A *Trichiurus* with long, pointed, snout whose length is about equal to that of pectoral. Maxillary reaching nearly to vertical from middle of eye. Length of head, 7½ times its length; height of body, 16.

Color silvery, with darker dorsal.

Radial formula: D. 135; A. ca. 100.

This is a well-known form, frequently found in shoal waters from Cape Cod to the West Indies, and needs no description here.

The *Challenger* obtained the scabbard-fish off Inosima, Japan, at a depth of 345 fathoms. Young were obtained by the U. S. Fish Commission at station 2273, at 17 fathoms; 2289, at 7 fathoms; 2121-2, at 31-34 fathoms.

A commercial fishery of considerable importance exists at Jamaica. This species enters the estuary of the St. Johns River in Florida, and has been known to leap into rowboats. Linnæus wrote of it in 1758: *Totus argenteus exiliens ex aqua sæpe in cymbam.* (Systema Naturæ, ed. x, I, 246.)

Family CORYPHÆNIDÆ.

I Corifenidi, RAFINESQUE, Indice d' Ittiologia Siciliana, 1810, 29.

Coryphænidæ, LOWE, Proc. Zoöl. Soc., London, 1839, 80.—SWAINSON, Nat. Hist., etc., II, 1839, 177.—BONAPARTE, Catalogo Metodico, Pesci Europei, 1846, 76 (Fam. 64).—GILL, Arr. Fam. Fishes, 1872, 8 (No. 81, name only).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 458.

Coryphænini, BONAPARTE, Icon. Faun. Italica, Pesci, 1842, Introduzione.—GÜNTHER, Cat. Fish. Brit. Mus., II, 404.

Coryphænoidei, BLEEKER, Tentamen, 1859, XXIII (Familia 101).

Body compressed and elongate. Teeth on jaws, vomer, and palatines. Skull with crest. A single, elongate dorsal; anal shorter; pectoral very small; ventrals thoracic. Lateral line present. Gill membranes free from isthmus. Branchiostegals 7. No pseudobranchiæ. No air bladder. Pyloric appendages numerous. Vertebræ more than 10+14.

CORYPHÆNA, Linnæus.

Coryphæna, LINNÆUS, Syst. Nat., ed. X, 1758, I, 261.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IX, 268.—GÜNTHER, Cat. Fish. Brit. Mus., II, 404.—JORDAN and GILBERT, *loc. cit.*

Lampugus, CUVIER and VALENCIENNES, *op. cit.*, 317.—GILL, Proc. Acad. Nat. Sci., Phila., 1862, 127.

Body elongate, covered with small, cycloid scales. Cleft of the mouth oblique, the lower jaw projecting. Cardiform teeth on jaws and vomer and palatines; a patch of villiform teeth on the tongue. Skull-crest much more elevated in adult than in young. Dorsal many-rayed, low, extending from nape nearly to base of caudal; anal similar, but shorter; both without distinct spines; pectorals small; ventrals well developed, thoracic, I, 5, partly received into a groove in the abdomen; caudal fin widely forked.

Lütken has reviewed in his Spolia Atlantica the species of the genus *Coryphæna*, and an abstract of his conclusions is here presented:

The genus *Coryphæna*, the "Dolphins" as they are called by sailors, is one of those peculiarly pelagic in its characteristics, and it is an example, more remarkable than any other, of the extreme confusion which has resulted from the fact that a number of really limited existing species has been divided into a great number of nominal species, based only upon differences of age and sex, individual peculiarities, different geographical localities, carelessly made drawings, incomplete descriptions, etc., a confusion which has been wrongly charged to Cuvier. The mistake of separating the species into two genera, *Coryphæna* and *Lampugus*, has already been rectified by competent authority, and the number of species believed to be well founded at the same time was reduced from 19 to 6. He is now of the opinion that the number should not be more than 2, or at the most 3. The two time-honored species of Linnæus, the large Dolphin, "La Petite Dorrade" (*C. hippurus*), which reaches a length of nearly 6 feet; and the little Dolphin, "La Petite Dorrade" (*C. equisetis*), which rarely exceeds 2½ feet. In Spolia Atlantica, Lütken gives an extensive comparison of these two species, having special reference to the changes which they undergo with age, and those which, like the length of *C. equisetis*, are sexual; and these variations have been illustrated by figures of the head, which are reproduced in this work. Most of the species described and figured can, according to Lütken, be very easily assigned to the two cosmopolitan species referred to, which have been often brought in by sailors, the only ones, in fact, from which he has been able to get material for study. Lütken hesitates in his opinion concerning *C. pelagica* (*azorica*, *sicula*) of the Mediterranean, which has been accepted by most authors who have studied the Mediterranean fauna, but which very probably does not differ specifically from *C. hippurus*; at least, he felt obliged to regard as a young specimen of this species a little "*C. pelagica*" from the Mediterranean, which, under that name, was sent to him for examination by a museum in Italy. In support of his opinion that there are really only two species of *Coryphæna*, he mentions two circumstances—one, that Günther, although he formally acknowledges more, actually refers all the specimens in his own custody to these two species and has not recognized any others; and again, that Lütken himself has been able without difficulty to divide numerous specimens of young *Coryphæna*, from 18 to 62 millimeters long, caught by Scandinavian fishermen, into two series, representing two species, and to refer these series to the two species before mentioned, and to no others, to wit, most of them to *C. equisetis*, and a fewer number to *C. hippurus*. The little *Coryphænas* are so dissimilar to the adults that it is very easy that they should have given rise to mistake, and thus it has happened that the young *C. hippurus* has been described by Pallas under the name of *C. fasciolata*. Lütken, in the work referred to, gives comparative descriptions of the young individuals of both species in their successive states and in relation to their adult forms, and gives figures illustrative of his ideas, calling attention to the fact that the greater length of the ventrals in *C. hippurus*, and their point of origin under the pectorals less farther backward than in *C. equisetis*, is one of the best means of separating the young of the two forms, and corresponds also to one of the best distinctive characters of the adult. The small individuals of both species not only have the preoperculum provided with spines, but also a scapular spine and supraorbital spine on each side. The larger specimens have the body very elongate, but are at the same time less thick, without being compressed, as they are in advanced age. The dorsal is relatively as low as in *C. equisetis:* in the adult, its origin at a point scarcely behind the anterior margin of the eye; in the young, above the posterior margin of the preoperculum; in those still younger, between the preoperculum and the opening of the gills; in *C. hippurus*, adult, above the posterior margin of the pupil; in the younger specimens of the same species, above the branchial opening, and so on. The system of coloration is a marked character in the different ages.

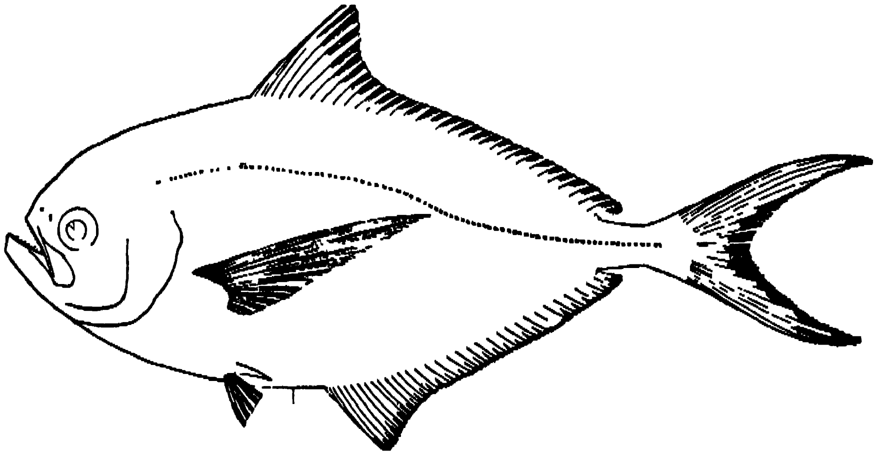
Family BRAMIDÆ.

Bramidæ, LOWE, Pisc. Syn. Maderensium, etc. (1834); Trans. Cambridge Philos. Soc. 1836, 197.—GILL, Arrangement Families of Fishes, 1872, 9; Century Dictionary, 659.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 455 (in part).

Bramini, BONAPARTE, Catalogo Metodico, 1846, 76 (Subfam. 132).

Bramæformes, BLEEKER, Tentamen, 1859, XXII.

Scombroids with short, oblong, compressed body. Head rounded; snout, obtuse, convex; mouth wide, oblique. Vertical fins, long, elevated, anteriorly continuous, with but few spinous rays. Ventrals thoracic. Teeth on vomer and palatines. An exterior row of strong teeth in the jaws. Premaxillaries protractile. Branchiostegals 7. Pseudobranchiæ present.



THE POMFRET (*Brama Raii.*)

A single genus *Brama*, of which *Taractes* (without spinous portion to dorsal and anal) is the young.

They are strictly pelagic, and it would seem probable that they descend to considerable depth.

BRAMA, Schneider.

Brama, SCHNEIDER, Bloch's Systema Ichthologiæ, 1801, I. 98 (type, *B. atropos* Schn.).—RISSO, Hist. Nat. Eur. Mérid. III, 433.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., VII, 281.—GÜNTHER, Cat. Fish. Brit. Mus., II, 408.—JORDAN and GILBERT, Bull. XVI, U.S. N. M., 455.

Taractes, LOWE, Proc. Zoöl. Soc. 1863, 82.—POEY, An. Soc. Esp., V, 148.—GÜNTHER, Cat. Fish. Brit. Mus., II, 410.

Pterycombus, FRIES, Vet. Akad. Handl., 1837.

Body compressed and more or less elevated, covered with rather small scales; cleft of the mouth very oblique, with the lower jaw longest. Dorsal and anal fins elongate, the former with 3 or 4, the latter with 2 or 3 spines; caudal deeply forked; ventrals thoracic, with one spine and five rays. The jaws with an outer series of stronger teeth; the teeth of the palatine bones and of the vomer are easily lost. Opercles entire. Seven branchiostegals; air-bladder, none. Pyloric appendages in small number. (*Günther.*)

A very elaborate study of *Brama* has been completed by Lütken, based upon a large series, chiefly of young specimens. Concerning *B. Raii* he concludes that it is quite cosmopolitan in its distribution, occurring from the Faroe Islands to the Cape of Good Hope, and is represented by closely similar, if not identical, forms on the coast of Chili (*B. chilensis* and *australis*) and New Zealand (*B. squamosa*) and in the waters of Japan. He states that it has not yet been found in the West Indies or off the east coast of North America, overlooking, perhaps, the fact that *Brama Raii* was observed at the Bermudas in 1880 by Dr. Goode. He considers *B. orcini* and *B. Dussumieri* and *Taractes asper* to be immature forms and gives a very doubtful acceptance to six species, claiming to be distinct from *B. Raii*, described from various parts of the Atlantic:

Brama Agassizii, Poey (Mem. Hist. Nat. Cuba, II, 1856–8, 204). Cuba.
Brama Brevoorti, Poey (*loc. cit.*, 206). Cuba.
Brama Saussurii, Lunel (*Revision*, etc., 185, pl. II). Cuba.
Brama longipinnis, Lowe (Proc. Zoöl. Soc., 1843, 82). Madeira.
Brama princeps, Johnson (Proc. Zoöl. Soc., 1863, 38, pl. VII). Madeira.
Brama Raschi Esmark (Forh. Vid. Selsk., Christiania, 1861). Finmark, Iceland.

Serious discussion of these forms can not well be attempted without a large series of specimens of all ages. In the meantime, it is most convenient to consider all the Atlantic forms as members of a single species, quite variable in the proportions of the body and the fins.

B. japonica, Hilgendorf, has the snout more convex than *B. Raii*, shorter vertical fins, and smaller paired fins, and the lesser size of the scales in the axils of the pectorals.

Family DIRETMIDÆ.

Diretmidæ, GILL, MS.

Scombroideans with a disciform body (suggestive of *Priacanthus*) preoperculum prolonged downward and separating the operculum from other bones; supramaxillaries wide behind; a long dorsal and anal with simple (?) rays, and ventrals thoracic. (*Gill*).

DIRETMUS, Johnson.

Diretmus, JOHNSON, Proc. Zoöl. Soc. Lond., 1863, 403.
Discus, CAMPBELL, Trans. New Zeal. Inst., XI, 1879, 297.
Gyrinomene, VAILLANT (name only), Exp. Sci. Travailleur et Talisman, 1887, 355, 18.

Body much compressed, short and elevated, covered with small, coarsely spinous scales, on which no lateral line can be traced; abdomen prominent and keeled. Mouth wide, obliquely ascending, with projecting lower jaw. The jaws are armed with a very narrow band (which, posteriorly, becomes a single series) of small fine teeth of unequal size. The vomer and palatine bones are toothless. The maxillaries terminate at their upper and inner extremity in a pair of short-pointed processes, which form peculiar fang-like projections in the inside of the mouth in front of the vomer. Bones of the head thin, with wide, muciferous cavities, the lower limb of the preoperculum denticulated. Eyes very large. Dorsal long, without spinous division; anal similar in form and composition; interradial membrane very fragile. Pectorals large; ventral fins thoracic, with more than 5 rays (?). Branchiostegals 7; pseudobranchiæ. (*Günther.*)

DIRETMUS ARGENTEUS, JOHNSON. (Figure 234.)

Diretmus argenteus, JOHNSON, Proc. Zoöl. Soc. London, pl. XXXVI, fig. 1.—VAILLANT, loc. cit., 355.

The specimen from Madeira, described in detail and well figured by Johnson, was the only one known until the French expedition obtained another off the coasts of Morocco in 1,105 meters. Johnson ascribed to it, although with doubt, 10 ventral rays, but the rays are much confused, broken, and split down to the base, and it is fortunate that Vaillant has been able to make out the true ray formula to be I, 5. The spine is enlarged into a thin scalpel-shaped lamella and marked with numerous oblique striæ.

Günther concluded, from the structure of the cranial bones, the immense eyes, the black color of the cavity of the mouth and pharynx, and also from the extreme scarcity of the fish, that this species belongs to the deep-sea fauna, and subsequent explorations proved the wisdom of his prophecy.

Radial formula: D. 27; A. 22–25; P. 18; V. I, 5.

Günther remarks concerning *D. aureus*, Campbell:

> I should be inclined to refer this fish, which is known from four specimens, 2¾ inches long, cast up on Hokitika beach (New Zealand), to the same species as the Madeiran specimen, but for the seeming absence of the enlarged ventral spine. This, of course, might be also accounted for by the less advanced age of the specimens. All the other differences as they appear in the description would probably disappear on a direct comparison of the examples. The perforations of the interradial membrane of the dorsal and anal fins, which Campbell regards as an extraordinary character, may also be seen in the Madeiran type, and are due to the extremely delicate structure of the membrane. The radial formula is D. 26; A. 21; P. 17.

Family PTERACLIDIDÆ.

Pteraclinæ, SWAINSON, Nat. Hist. Fishes, etc., 1839, II, 178.
Pteraclididæ, GILL, Arr. Families Fishes, 1872, 9 (No. 85).

Scombroids with oblong or short elevated body, compressed, covered with moderate sized scales. Dorsal and anal high, composed of simple spines or rays. Ventrals jugular.

PTERACLIS, Gronovius.

Pteraclis, GRONOVIUS, Act. Helvet., VII, 44, 1772 (type, *Coryphæna velifera*, Pallas).—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IX, 359.—GÜNTHER, Cat. Fish. Brit. Mus., II, 2, p. 410.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 455.

Body compressed, oblong, covered with moderate-sized scales. Snout obtuse convex, compressed. Cleft of mouth wide, oblique. Eye large. Dorsal very elongate, much elevated, extending from the forehead to the caudal, composed of filiform spines, unarticulated, triangular in form; anal similar in form and structure; ventrals jugular, of 4–6 slender rays. Pseudobranchiæ present. Air-bladder very small.

This is a pelagic form, widely distributed, and but sparsely represented in museums. The characters by which the four recognized species are separated are not of the greatest diagnostic importance.

Pteraclis papilio, LOWE, was described in 1843 (Proc. Zoöl. Soc., 1843, p. 83), from Madeira. It has 41 rays in the dorsal, and 35 in the anal. Lowe believed that the last six rays of the dorsal were detached from the rest.

Pteraclis ocellatus, C. & V. (Hist. Nat. Poiss., IX, p. 363, pl. CCLXXI) was described from Mozambique material. It has a few more rays in the vertical fins (D. 45; A. 42).

Pteraclis carolinus, C. & V., was described from a mutilated specimen, 4 inches long, from the coast of South Carolina.

Pteraclis velifer, the *Coryphæna velifera* of Pallas, came from the Indian Ocean. Lütken has seen fit to identify with it several young individuals 7 to 15 millimeters long, taken with dredge by Andrea and Joersen in the Atlantic, lat. 21° 29′ N., long. 28° 36′ W. (Spolia Atlantica, 502 and 600, pl. IV, fig. B).

The single specimen obtained by the *Albatross* agrees sufficiently well with the description of *P. carolinus* and is assigned to that species for the present.

PTERACLIS CAROLINUS, CUVIER and VALENCIENNES. (Figure 218.)

Pteraclis carolinus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IX, 1833, 368.—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 411.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., p. 455.

A *Pteraclis* with smaller mouth and larger scales than *P. ocellatus*, or *P. trichypterus*, and with the fourth dorsal very perceptibly longer. (*C. & V.*)

Radial formula: D. 52; A. 44.

Color, silvery.

The type was from the coast of Carolina, sent to Paris by M. Bosc.

Family STROMATEIDÆ.

? *Stromatini*, RAFINESQUE, Indice d'Ittiologia Siciliana, 1810, 39.
Stromateini, BONAPARTE, Catologo Metodico, Pesci Europei, 1846, 76 (subfam. of *Coryphænidæ*).
Stromatiniæ, SWAINSON, Nat. Hist. Fishes., etc., 1839, II, 177.
Stromateina, GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, 397.
Stromateidæ, GILL, Arr. Families Fishes, 1872, 8 (No. 83); Trans. Amer. Phil. Soc., 1881, 684.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus.

Scombroids, with body compressed and more or less elevated, covered with small or minute cycloid scales. Profile anteriorly blunt and rounded. Mouth small. Premaxillaries protractile or not. Dentition feeble; no teeth on vomer or palatines; œsophagus armed with numerous horny, barbed, or hooked teeth. Gills 4, a slit behind the fourth. Gill membranes either free or more or less joined to the isthmus. Gill rakers rather long. Pseudobranchiæ present. Cheeks scaly. Preopercle entire or serrate. Lateral line well developed. Dorsal fin single, long, with the spines few or weak, often obsolete; anal fin long, similar to the soft dorsal, usually with 3 small spines, which are often depressible in a fold of skin; ventrals thoracic or jugular, normally I, 5, but sometimes reduced or altogether wanting; caudal fin lunate or forked. Usually no air bladder. Pyloric cæca commonly numerous. Vertebræ more than 10+14.

The members of this family are, as a rule, surface-dwellers. Among them is the Rudder fish or Log fish, *Leirus perciformis*, common everywhere in summer, lurking under floating spars and driftwood, and often swimming under the keels of vessels. The Harvest fish, *Stromateus triacanthus*, is also found near the surface, swimming under large Medusæ. *Apolectus* is probably the young of *Stromateus* and *Hoplocoryphis* probably that of *Schedophilus*. In all warm seas the young of the various species of this family are sure to occur in the pelagic surface fauna.

CENTROLOPHUS, Lacépède.

Centrolophus, LACÉPÈDE, Hist. Nat. Poiss., IV, 441.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IX, 330.—GÜNTHER, Cat. Fish. Brit. Mus., II, 402.—DAY, Fishes of Great Britain and Ireland, I, 110.
Pompilus, LOWE, Proc. Zoöl. Soc., London, 1839, 81.
Acentrolophus, NARDO, Prod. Ichth. Adr., 62.

Stromateids, with elongate body covered with minute scales. Lateral line arched anteriorly. Mouth moderate or small. Teeth small, in jaws only. Vomer, palatines and tongue toothless. Epibranchial bone of fourth arch with long toothless processes. Dorsal long, continuous, without spinous division. Anal with the thin anterior rays unbranched, resembling feeble spines. Ventrals thoracic, moderate. Pectorals moderate. Caudal furcate. Bones of vertical fins scaly. Air bladder small. Pyloric appendages, nine or ten.

This genus is represented by two species recorded from the Atlantic. *C. pompilus* (Lac.) C. and V., is not very unusual in the vicinity of Nice, though rare elsewhere in the Mediterranean, and has occasionally been taken in the Atlantic as far north as the British Isles and south to Gibraltar and Madeira. *C. britannicus*, Günther, is known from a single specimen cast ashore on the coast of Cornwall in 1859. Both forms are well figured by Day, pl. XL. The "Blackfishes" undoubtedly swim at times near the surface, but there is ground for supposing that they live also at considerable depths, especially *C. britannicus*.

There are other species catalogued by the Italian and French ichthyologists under the name *Centrolophus*, but none of them appear to be other than surface-swimming forms. They are all exceedingly rare and not well understood.

CENTROLOPHUS POMPILUS, (GMELIN), CUVIER and VALENCIENNES. (Figure 222.)

Coryphæna pompilus, ARTEDI, Gen. Pisc., 16, syn. 29.—GMELIN; Linn., Syst. Nat., 1193.—RISSO, Ichth., Nice, 180.
Centrolophus pompilus, CUVIER and VALENCIENNES, IX, 334, pl. CCLXIX.—GÜNTHER, Cat. Fish. Brit. Mus., II, 403.—DAY, *loc. cit.*—GIGLIOLI, Elenco, 26.
Perca nigra, GMELIN, *loc. cit.*, 1321.
Centrolophus niger, LACÉPÈDE, Hist. Nat. Poiss., IV, 441, pl. X, fig. 2.
Acentrolophus maculosus, NARDO, Prod. Ichth. Adr., sp. 62.
Pompilus Rondeletii, LOWE, Proc. Zoöl. Soc., London, 1839, 81.

A *Centrolophus* having height of body 4–5 in total length, and length of head 5. Upper maxillary extending to below anterior margin of orbit. Dorsal origin above first third of pectoral. Scales minute, forming sheath to basal third of vertical fins. Color, brown, clouded with lighter.

Radial formula: D. 38–41; P. 21; V. I, 5; A. 23–25; C. 17.

The Blackfish occurs in the Mediterranean and along the coasts of Europe from Spain to Yorkshire and Northumberland. Lowe observed it about Madeira.

A specimen, 9 inches long, was taken off Dennis, Mass., Nov. 23, 1888, by the U. S. Fish Commission.

This form is pelagic, like the pilot fishes, and is believed to be able to descend to considerable depths.

SCHEDOPHILUS, Cocco.

Schedophilus, COCCO, Giorn. Innom. Mess. Ann. III.—GÜNTHER, Cat. Fish Brit. Mus., II, 412.
Crius, VALENCIENNES, in Webb and Berthelot, Iles Canar. Poiss., 45.

Body compressed, oblong, covered with minute scales; cleft of the mouth of moderate width, with the jaws equal; eye moderate; preopercular margin spiny. One dorsal, commencing behind the nape of the neck, formed by flexible spines and branched rays, extending nearly along the whole back; anal similar to the dorsal, but much shorter. Ventrals thoracic (subjugular in *Sch. maculatus*), formed by 1 spine and 5 rays. A series of small teeth in the jaws; palate smooth. Branchiostegals 7. Pseudobranchiæ.

The species of this genus are pelagic; young examples, at least, are frequently captured in the surface net in the open ocean. Some of the species, however, possess structural characters which indicate bathybial habits; for instance, a singular want of firmness of the tissues, especially of the bones. (*Günther.*)

SCHEDOPHILUS MEDUSOPHAGUS, Cocco. (Figure 223.)

Schedophilus medusophagus, COCCO, Giorn. Innom. Mess. Ann., III, No. 7, 57.—BONAPARTE, Fauna Italica, Pesc., C. fig.—GÜNTHER, Cat. Fish. Brit. Mus., II, 412; Fisch. d. Südsee, 149; Trans. Zoöl. Soc., London, XI, 1882, 223, pl. LXVII; Challenger Report, XXII, 1887, 46.

The body is strongly compressed, of an elongate, ovoid shape, its depth being contained 2⅔ times in the total length, fins not included. The head is small, as deep as long, and less than one-fourth of the total length (without caudal). Interorbital space convex, broader than the diameter of the eye, which is situated immediately below the upper profile of the head, nearly as long as the snout, and one-fourth the length of the head. Snout obtuse, with projecting lower jaw and oblique mouth. Mouth of moderate width, the cleft extending to below the front margin of the eye. Maxillary rather narrow, but widening toward its extremity. Teeth minute, implanted in a single series on the sharp edge of the jaws. The palate is toothless.

The preopercular margin is armed with short spines, which usually become a little longer on the posterior margin; these longer spines have an oblique dorsal direction. Also the interoperculum is spinous, the suboperculum less so. Operculum membranous; its upper portion shows radiating osseous striæ, which project beyond the margin.

The gill rakers of the outer branchial arch are long, narrow, and rather widely set. Gill openings very wide.

The dorsal fin commences above the root of the pectoral and terminates at a short distance from the caudal, the caudal peduncle being about as deep as long. This fin is rather low, the longest rays, behind the middle of the fin, being not erectile into a vertical position. The caudal fin (slightly injured) has a rounded margin, and is rather shorter than the head.

The pectoral fin has a broad base, is more than half as long as the head, and has the upper rays longer than the lower. Ventrals rather small, close together, and inserted in advance of the pectorals.

The entire fish is covered with minute, cycloid scales; on the head they appear to be present on the cheek only. The upper part of the head is covered with a thick, spongy skin, as in *Centrolophus*.

Radial formula: D. 38–50; A. 25–29.

The colors of a fresh fish are a pale greenish olive, marbled with darker, the markings being in the form of spots on the upper, and of irregular longitudinal bands on the lower half of the body. Also the vertical fins are spotted with blackish. The iris is nearly white, and a ring of small white pores encircles the orbit.

The specimen described is 9½ inches long and in good condition, with the exception of the lower part of the abdomen, which is lacerated and shrunk in consequence of the loss of the intestines. All parts of the body are in that state of softness which is peculiar to many deep-sea fishes. (*Günther.*)

Adult specimens have, according to Günther, been obtained in the Mediterranean, one on the coast of Ireland, and another in the South Sea, near Samoa.

This is primarily a pelagic surface form, but it seems very possible that it inhabits the middle or lower strata of the ocean as well. Dr. Günther says that it is evident that at least in the adult state it descends to some depths. The want of firmness in the tissues seems to clearly indicate it as a deep sea fish. He hazards the opinion that the depth to which it may descend, probably does not exceed 100 fathoms. Calling attention to the fact that the young of the species are much more frequently found near the surface than the adult, he mentions the habit of this and similar forms of congregating around the floating Medusæ, and also questions the accuracy of the theory that fish ever feed upon Medusæ, since he says the fish could draw but little nourishment from these animals. As a matter of fact, many of our surface oceanic fishes feed voraciously upon various forms of Medusæ and upon *Salpa*. We have often taken large quantaties of this kind of food from the stomachs of various surface Scombroids, as well as from *Alutera* and *Mola*.

Dr. Günther's full description, which is quoted above, is taken from a specimen obtained at Port Rush, County Antrim, Ireland, in August, 1878, captured in a salmon net. Mr. Ogilby, who sent it to the British Museum, was very much impressed by the softness of the flesh. "It was," he says, "the most delicate adult fish I ever handled; so much so, that within twenty-four hours after its capture the skin of the belly and the intestines fell off when it was lifted, and it felt in the hand quite soft and boneless." This is quoted to emphasize what has been said regarding the softness of its tissues, and its similarity in this respect to the fishes inhabiting the abyss.

ICOSTEUS, Lockington. (Figure 224).

Icosteus, LOCKINGTON, Proc. U.S. Nat. Mus., III, 1880, 63.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 618.

Body oblong, much compressed throughout, the head thicker than any part of the body. Dorsal outline rising rapidly to the origin of the dorsal fin, thence more regularly curved; the region at the base of the dorsal and anal strongly compressed; caudal peduncle slender, widened at the base of the fin. Mouth large, horizontal; maxillary narrow, reaching to beyond middle of eye. Teeth in jaws in one row, slender, sharp, closely and regularly set, those in the lower jaw largest; no teeth on vomer, palatines, or pharyngeals. Gill-rakers flexible, few; gill-membranes separate, free from the isthmus. Branchiostegals 6. Pseudobranchiæ well developed. Lateral line conspicuous, continuous, decurved, groups of small spines present along its entire length. No scales anywhere on body or fins. Fins rough, with small spinules; a series along each ray, dividing as the ray branches; dorsal fin commencing above the axil of the pectoral, composed of 50 to 60 rays, which are all soft and flexible, some of the anterior unbranched; the fin low in front, increasing in height behind; none of the rays more than once forked; anal shorter than the dorsal, similar to it, of 35 to 40 rays; some of the anterior apparently undivided; caudal fin elongate, fan-shaped, the middle rays produced; accessory rays numerous, procurrent; pectorals with a fleshy base, fan shaped, the middle rays longest; ventrals thoracic, inserted just behind the pectorals, narrow, consisting of 1 short subspinous ray and 4 long soft rays. Air bladder large. Vertebræ numerous, the vertebral column extremely flexible and soft. Cranial bones tolerably firm; bones of the face and opercles very flexible. The entire body is characterized by a want of firmness, as it can be doubled up as readily as a piece of soft, thick rag. (*Jordan and Gilbert.*)

This genus is represented by a single species. *I. enigmaticus*, Lockington (*Schedophilus enigmaticus*, Günther, Challenger Report, XXII, 46, Pl. XLIV). The exact source of the types is not known. They were bought in the San Francisco market in 1878, and the fishmongers said that they were deep-sea fish. Lockington reports a small specimen in the museum of the University of California, found off the coast of Washington. The fact that they have not since been seen shows how unusual they are, and proves that they live at great depths —if any proof other than their remarkable structure were required. Steindachner also had a specimen.

SCHEDOPHILOPSIS, Steindachner. (Figure 416).

Schedophilopsis, STEINDACHNER, Sitzb. Ak. Wiss. Wien. LXXXIII, 1881, 396; Ichth. Beiträge, XI, 4.

Acanthopterygians having the form of the body and the dentition as in *Schedophilus*. Body scaleless, with the exception of the lateral line. Dorsal and anal fins long, the former beginning on the nape. Branchiostegals 6; pseudobranchiæ present. The fin-rays thickly covered with sharp, nettle-like spines, visible to the naked eye.

The type of this genus is *Schedophilopsis spinosus*, Steindachner (*loc. cit.*), obtained by him at considerable depths off the coast of California, near San Francisco. The National Museum possesses a specimen (Cat. No. 37327) obtained by Dr. August C. Kinney, at Astoria, Oregon.

ICICHTHYS, Jordan and Gilbert. (Figure 226.)

Icichthys, JORDAN & GILBERT, Proc. U. S. Nat. Mus., III, 1880, 305; Bull. XVI, U. S. Nat. Mus., 621.

Body elongate, not elevated, not compressed at the bases of the vertical fins. Head moderate. Eyes lateral. Mouth terminal, little oblique, with small sharp teeth in one series in the jaws only. Premaxillaries not protractile. Gill membranes separate, free from isthmus; gill-rakers long. Pseudobranchiæ present. Branchiostegals 7. Body covered with small cycloid scales. Lateral line continuous, unarmed. Bases of fins without spinules; dorsal and anal fins long and low, composed of soft rays only; pectoral fins moderate, their bases fleshy, as in *Icosteus*; ventral fins small, thoracic, I, 5. Pyloric cæca about 6, large. Bones all very flexible, cartilaginous. (*Jordan & Gilbert.*)

Represented by a single specimen obtained at the same time and under the same circumstances as *Icosteus enigmaticus*. This was described by Jordan & Gilbert under the name *Icichthys Lockingtonii*. Dr. Günther's catalogues it under *Schedophilus* (Challenger Report, XXII, 46). This form is but doubtfully related to those which immediately precede.

Family ACROTIDÆ.

Acrotidæ, GILL, MS.

Acanthopterygians with a long, compressed body, naked skin, long low dorsal and anal, large caudal on slender peduncle, no ventrals, no palatal or pharyngeal teeth, and numerous (about 70) vertebræ. (*Gill.*)

ACROTUS, Bean.

Acrotus, BEAN, Proc. U. S. Nat. Mus. 1887, 631.

Shape of body as in *Icosteus*, from which it differs in the absence of ventrals and spiny tubercles along the lateral line, and in having an emarginate caudal.

Head short; mouth moderate; eye small. Teeth minute, uniserial, on intermaxillary and mandible; vomer, palate, and pharynx toothless. Gill openings wide, the membrane not attached to the isthmus. Gills 4, a wide slit behind the fourth. Gill rakers short, soft, and flexible. Pseudobranchiæ well developed. Branchiostegals 6. Vent somewhat in advance of middle of body. Caudal peduncle very slender. Ventrals absent. Caudal large, emarginate. Skin naked. Lateral line without tubercles. Bones all soft and flexible. Size large.

The genus is represented by a single species, *Acrotus Willoughbyi*, Bean (*loc. cit.*), described from a specimen nearly 6 feet in length cast upon the beach at Quinaielt Agency, Washington, in July, 1887.

ACROTUS WILLOUGHBYI, BEAN. (Figure 225.)

Acrotus Willoughbyi, BEAN, *loc. cit.*

The greatest height of the body at the vent is contained 3⅛ times in the total without the caudal. The caudal peduncle is very slender; its least height little more than one-third of its length ánd not much exceeding one-fourth the length of the head. The length of the head is about one-sixth of the total without caudal. The snout forms one-fourth, the eye one-twelfth, and the interorbital width one-third the length of the head. The maxilla reaches to below the middle of the eye. The upper jaw is one-third as long as the head. Gill rakers 15, of which 9 are below the angle; the longest about as long as the eye.

The origin of the dorsal has not been clearly made out; the first ray that can be seen without dissection is nearly midway between the eye and the end of the dorsal, but dissection reveals 7 rays in advance of this. The dorsal begins much nearer the head in *Icosteus*, and dissection may show that rays are developed much farther in advance than we have been able to distinguish them. Forty-one rays have been counted in the dorsal, the longest of them little exceeding one-third length of head. The caudal peduncle is as long as the head without the snout. The caudal is large, emarginate; its middle rays four sevenths as long as the external rays and two thirds as long as the head.

The vent is at a distance from the tip of the snout equal to 3 times, and from the base of the caudal a space equal to 3⅓ times the length of the head. The first evident anal ray is at a distance behind the vent equal to one-sixth length of head. The anal has 38 rays, the longest a little less than one-third as long as the head.

The pectoral is placed close to the head and nearly in the middle of the height; its length is two-thirds the length of the head; it has 20 rays.

The lateral line has a slight curve over the pectoral and becomes median about half way between the pectoral and the vent. Skin naked. Peritoneum very dark.

Color chocolate brown; inside of mouth and gill openings rich, dark brown.

The type of the species (catalogue number 39340) is 63½ inches long. The viscera are wanting. The specimen was obtained at Damon, Wash., July 9, 1887, by Charles Willoughby.

The following extracts from Mr. Willoughby's letter contain additional information about the species:

> A few days ago I discovered a fish lying on this beach different from any that I have ever seen before. It seemed to be perfectly fresh and as if it had not been on shore more than an hour. The color of the skin seemed to have been nearly all removed by washing about on the sand. The [pectoral] fin and tail had been partly destroyed. The fish was 6 feet long. The flesh of the fish is very white, fine grained, and fat. The fish in color and fatness resembles the black cod, *Anoplopoma fimbria*. The bones are extremely soft, so much so that the fish can not bear a weight of 5 pounds pulling on it without severing the head. The fish was a female, with a large roe well matured. None of the oldest Indians of the agency have ever seen anything like it.

The fish was preserved in brine, and has now become so fragile that it must be given to the osteologist to be prepared as a skeleton. Mr. Lucas has found in front of the rayed portion of the dorsal fin numerous groups of cartilaginous plates representing interneurals, but no rays can be found supported by them. He counted 70 vertebræ and observed what appear to be rudiments of a pelvis, but no traces of ventral fins.

Family GRAMMICOLEPIDIDÆ.

Grammicolepididæ, POEY, Anal. Soc. Esp. Hist. Nat., II, 1873.

Scombroidea, having a compressed body covered with vertical, linear scales. Mouth small, terminal; teeth minute, asperities on the jaws. Lateral line sinuous, unarmed. Two dorsals, the first very short, triangular, anal preceded by two short, stout, separate spines. Caudal vertebræ numerous.

GRAMMICOLEPIS, Poey.

Grammicolepis, POEY, Anal. Soc. Esp. Hist. Nat., II, 1873, 00.—SHUFELDT, Journ. of Morphology, II, 1888, 272-296, with 18 figures.

Grammicolepids with body deep, compressed, large eye, small mouth, head and opercula partly rugose; teeth minute, and absent from the palatines. Pectoral short and rounded. Dorsal, anal, and pectoral branched.

GRAMMICOLEPIS BRACHIUSCULUS, POEY (Figure 221).

Grammicolepis brachiusculus, POEY, *loc. cit.*—SHUFELDT, *loc. cit.*

The length of this extraordinary fish is 470 millimeters. The head enters five times into the total length of the body, and 2⅜ times into its greatest depth. The body is much compressed, and quite deep. The very large eye is contained 2⅛ times in the length of the head, and lacks the *membrana adiposa.*

The branchial apertures are deeply cleft, but I fail to find more than four branchiostegal rays, without being able to assert that there may not be a greater number of them. The snout is short. The prefrontal, the turbinal, and the anterior suborbital are extremely hard, and covered with spiny rugosities. The preoperculum and interoperculum have rugose borders, while the remaining opercular bones are entirely so. The mouth is small, subvertically cleft; the premaxillary process is large, and is lodged in a fossa of the cranium. The maxillary is complicated. The teeth are simply a narrow row of minute prickles; they do not occur upon the vomer nor the palatines.

The leading spine of the first dorsal series is rugose, as is the first ventral, the two postanals, and the external ones of the tail, which latter show the condition equally well in either one.

The rays of the pectoral, second dorsal, and the anal fins are compressed, and do not ramify at their extremities. The pectorals are very short and rounded. On the other hand, the vertical fins, the dorsal, and anal are well developed.

The tail was injured and apparently cut; the membrane which unites its rays had disappeared; the peduncle which supports it is large, and capable of communicating a powerful impulse to the act of progression. The thoracic ventrals unquestionably possess a rugose spine and 6 flexible ones that are branched.

Aside from the frontal bones and the suborbitals where the skin abruptly terminates, and the nasal portion of the snout, all the trunk and the head is covered with scales, including the inferior mandible.

The scales in no way resemble those found among the acanthopterygian fishes. Their length greatly exceeds their width; they have the appearance of parchment—transparent, brittle when dry—overlap each other, and are strengthened longitudinally by a raised lineal ridge.

Their contact with each other is so extremely intimate that it lends to the skin of either side a very smooth appearance—so much so, that the rough borders of the scales would not be suspected without the aid of the fingers.

Thanks to the length of these scales, four, five, or six of them are sufficient to span the height of the trunk, one of such a series being crossed by the lateral line, where its presence is denoted by a raised ridge.

The leading scales on the body, above as well as below, are shorter, and where carried on to the head are doubly as firm as those found at the fin rays.

Without having done more than counted the scales in a longitudinal line, I calculate that the number is considerably above 200; those of the head, although shorter, have the same form as those of the trunk. There are no scales upon the fins.

The caudal peduncle develops neither a cartilaginous nor an osseous plate at its sides. Posterior to the anus the ventral keel is rough.

The cranium is more cartilaginous in structure than it is osseous, except the frontals, which are rugose in line in the supraorbital region, and bristly in front, as are the turbinals and suborbitals; these latter are four in number, the last three being very slender. There are two supratemporals.

The inferior mandible is characterized by several rows of minute spines upon the dentary and articular elements. The vertebræ number 10 plus 36.

The anterior neural spine is not excavated, being lofty and smooth; the five that follow are short and inclined backwards. The remaining ones are slender, which applies also to their hæmapophyses. The last vertebra is without lateral spines.

The pleurapophyses are inconspicuous, feebly developed, and have much the same size and shape as the epipleurals. I discover but one pseudo-interneural spine in front of the one that supports the first dorsal fin ray. (*Shufeldt.*)

Radial formula: D. 6, 34; A. 2, 33; V. I, 6; P. 15; C. 1, 13-1.

A single specimen of this remarkable fish was obtained by Poey, at Cuba, in 1872.

An elaborate anatomical study has been made by Dr. Shufeldt.

Family NOMEIDAE, Günther.

Nomeina, GÜNTHER, Cat. Fish, Brit. Mus., II, 387.
Nomeidæ, GILL, Arr. Families Fishes 1872, 10 (No. 91).—JORDAN and GILBERT, Bull, XVI, U. S. Nat. Mus., 448.

A family of teleocephalous fishes related to the mackerels. The body is oblong, compressed, and covered with cycloid scales; the lateral line continuous and unarmed; the head compressed; the opercula unarmed; the nostrils double; the mouth with a lateral cleft, upper jaw scarcely protractile; teeth small and conical, on the palate as well as jaws; branchial apertures extensive; branchiostegal rays 5 or 6; dorsal more or less divided, and with the spinous portion shorter than the soft. The skeleton has numerous vertebræ (in *Nomeus* 16+25); the stomach very numerous pyloric appendages.

This family has been constituted for the reception of several genera, at one time referred to the Scombridæ, viz, *Nomeus*, *Gasteroschisma*, *Cubiceps*, *Seriolella* and *Platystethus*. The species are all marine, and found in tropical or warm temperate seas. The last two are represented only in the Australian and Polynesian waters.

KEY TO THE GENERA.

Ventrals long, surpassing the pectorals.
Mouth narrow.—Ventrals long and broad, attached to abdomen.
Teeth on jaws, vomer and palatines .... NOMEUS
Teeth on jaws only .... BATHYSERIOLA
Mouth wide. Ventrals very long, receivable in abdominal groove. New Zealand. [GASTEROSCHISMA]
Pectorals long, surpassing ventrals; snout inflated; teeth small .... PSENES

NOMEUS, Cuvier.

Nomeus, CUVIER, Règne Animal, ed. x, 1817, II, p. 315.—CUVIER & VALENCIENNES, Hist. Nat. Poiss., IX, 242.—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 387.

Body oblong, much compressed, with cycloid scales of moderate size. Lateral line placed high, not armed. Head with occipital crest but slightly developed; cleft of the mouth narrow. Teeth small, in a single series in the jaws; teeth on the vomer and palatines. The first dorsal continuous, with 10 or 11 spines; second dorsal and anal long, similar to each other, with no detached finlets; no separate anal spines; caudal fin not deeply forked; ventrals long and broad, attached to the belly by a membrane, depressible in a deep fissure in the abdomen. Pseudobranchiæ large. Air-bladder present. Pyloric cæca very numerous. Vertebræ, 16+25. Branchiostegals, 6.

This form was for thirty years considered to be most closely related to the Gobies. Its relation to the Scombroids was first pointed out by Cuvier in 1817.

NOMEUS GRONOVII, (GMELIN), GÜNTHER. (Figure 227.)

Gobius Gronovii, GMELIN, Linn., Syst. Nat., 1788, 1205.
Nomeus Gronovii, GÜNTHER, Cat. Fish. Brit. Mus. II, 387.
Nomeus Mauritii, CUV. and VAL., IX, 243.—GÜNTHER, II, 387.

Maxillary reaching to below the front of the eye; ventrals reaching front of anal, pectorals still further. Color, black, the upper parts blue. Sides silvery white or milky white, with about five black blotches, the first two, or more, of which are band-like. Each caudal lobe with a black blotch at the base. Younger examples have the blotches fewer and less defined. Ventrals with a broad black margin and with black along their inner edge, the rest white. A black blotch on the anal base near the origin of the fin. Pectoral base with a black blotch. Iris silvery white.

Radial formula: D. X–I, 26; A. III, 26.

Nomeus Gronovii is one of the most widely distributed and abundant of all pelagic fishes, occurring as it does in the Tropical Atlantic and in the Indian Ocean. It has been found as far north as the Bermudas (Goode). It abounds in the Sargasso Sea and under *Physalia*. Ten individuals were taken in a dip-net, from the deck of the *Albatross*, off the Florida coast, all swimming under one Portuguese man-of-war.

The large fan-shaped ventrals are used as support in resting on the bottom, and in swimming they are generally closed in their groove unless the fish is moving leisurely, when they may be partly expanded.

BATHYSERIOLA, Alcock.

Bathyseriola, ALCOCK, Ann. and Mag. Nat. Hist., 1890, II, 202.

Body oblong and compressed, covered with small, deciduous, cycloid scales. Lateral line apparently unarmed. First dorsal fin continuous, with rather feeble spines; the second and the anal much more developed, and without finlets. Anal spines approximated to and continuous with the rest of the fin. Ventral with a continuous membranous attachment to the abdomen. Cleft of mouth narrow; villiform teeth in the jaws only. Preopercular border entire. Seven branchiostegals. Pseudobranchiæ. Pyloric appendages numerous. No air bladder. Vertebræ, 10+14. (*Alcock.*)

The genus is represented by a single species, *B. cyanea*, Alcock, taken by the *Investigator* off the Madras coast, at station 96, in 98–102 fathoms.

PSENES, Cuvier and Valenciennes.

Psenes, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IX, 259.—GÜNTHER, Cat. Fish. Brit. Mus., II, 259.—GILL, Proc. Acad. Nat. Sci. Phila., 1862, 127; Trans. Am. Phil. Soc., 1886, 672.—LÜTKEN, Spolia Atlantica, 105 (513).
Cubiceps, LOWE, Proc. Zoöl. Soc. London, 1843, 82.—GÜNTHER, *loc cit.*—GILL, *loc cit.*—LÜTKEN, *loc cit.*
Atimostoma, SMITH, Ill. Zoöl. S. Africa, Fishes, pl. XXIV.
Navarchus, DE FILIPPI and VERANY, Mem. Accad. Sci. Turin, 2d ser., XVIII, 7.
Trachelocirrus, DOUMET, Rev. et Mag. Zoölogie, 1-63, pl. XV.

Body somewhat compressed, clothed with cycloid scales of moderate size. Mouth-cleft narrow, with short, swollen snout. First dorsal with 6 to 10 spines, second dorsal and anal much longer, similar, without finlets, 1 to 3 anal spines joined to soft part of fin. Pecto-

rals larger than ventrals. Lateral line unarmed. Small teeth in jaws. Branchiostegals, 5 to 7.

The young forms of this genus appear to have been found chiefly in East Indian and Australian seas and in the Pacific, the adult forms in the Atlantic and Mediterranean. Lütken, in his Spolia Atlantica, critically reviews the group in his usual masterly style.

PSENES PELLUCIDUS, LÜTKEN. (Figure 228.)

Psenes pellucidus, LÜTKEN, Spolia Atlantica, 1880, 516 (108), fig.; 601 (193).

A species of *Psenes* with a high, short, compressed body, nearly colorless and semitransparent, taken at the Strait of Surabaja, is recognized by Lütken as distinct.

Greatest height of the body (23 millimeters) contained 2¼ times in the total length (without caudal); the length of the head (13 millimeters) is one-quarter of the total length. Diameter of the eye, 5 millimeters; length of the snout, 3½ millimeters. The pectoral fins are 9 millimeters long; ventrals 14 millimeters, extending considerably beyond the end of the pectorals. The vertical fins are quite high (10 millimeters), and show a tendency to become falcate posteriorly. Dorsal fin with 12 spines and 34 rays; anal with 3 spines and 34 rays. Caudal fin furcate. Lateral line placed high. Scales small. Dentition as in the other species of the genus; teeth in the maxillary are finer and farther apart than in the mandible; the end of the maxillary reaches to the vertical from the anterior margin of the pupil. (*Lütken.*)

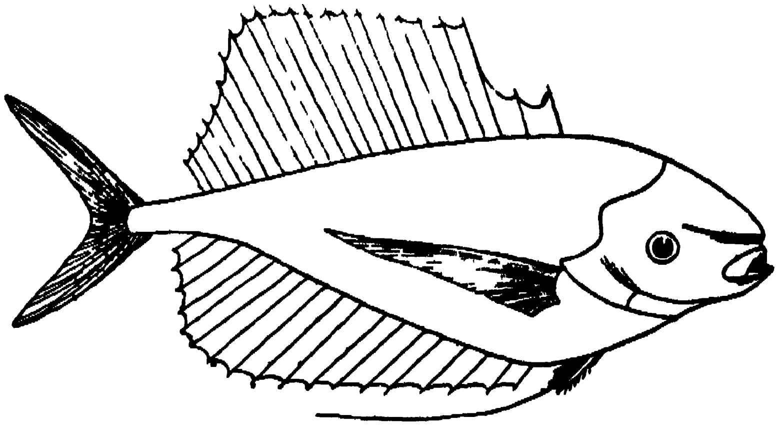
A single specimen was obtained by the *Albatross* in 32° 24′ N. lat., 76° 55′ 30″ W. lon., at a depth of 528 fathoms.

Lütken also describes another species of *Psenes* from the Atlantic, which he thinks may possibly be distinct—*Psenes maculatus*, Spolia Atlantica, p. 110 (518). A specimen, seemingly of this species, was obtained by the *Albatross* in the western Atlantic, N. lat. 27° 49′, W. lon. 76° 12′, over a depth of 633 fathoms. The specimen was taken at the surface. (Figure 229.)

Family LUVARIDÆ.

Dianidæ, GILL, Arrangement of the Families of Fishes, 1872, 9.
Luvaridæ, GILL, 1885, Century Dictionary, 3549.

Scombroids, with a compressed, oblong body, covered with minute granular scales. Mouth small; teeth in fine rows in the jaws. Vent thoracic. Dorsal and anal single, composed of unarticulated, widely-set spines. Ventrals absent, or subjugular, reduced, varying from I, 4 to 0,2, closing over the vent. A keel at root of caudal in adults. Branchiostegals, 5. Pseudobranchiæ present.



LUVARUS IMPERIALIS young. (After Day.)

Represented by a single genus and species.

LUVARUS, Rafinesque.

Luvarus, Rafinesque, Caratteri, Animali e Piante di Sicilia, 1810, 22.—Günther, Cat. Fish. Brit. Mus., II, 413.—Day, Fishes Great Britain, etc., I, 121.
Diana, Risso, *op. cit.*, 342.
Ausonia, Risso, Hist. Nat. Eur. Mérid., 1826, III, 267 (young).—Günther, *loc. cit.*
Proctostegus, Nardo, Mem. "De Proctostego," 1827.
Astrodermus, Cuvier and Valenciennes, Hist. Nat. Poiss., x, 1833, 353 (young).

Luvarids, with body oblong, anteriorly enlarged, but compressed and attenuated posteriorly. Mouth terminal, small. Teeth in a single row in jaws, minute, finely pectinate (in young also on palatines and tongue). A single dorsal, composed of unarticulated, flexible, widely-set spines, much longer in adult than in young; in adult occupying only the last half of the length of the body. Anal similar to dorsal. Ventrals thoracic, varying in extent, sometimes absent. Caudal forked. A longitudinal keel along either side of root of tail in adults. Vent below pectoral axils. Scales soft, deciduous, branny. Air-bladder large; cæcal appendages few. Bones soft and fragile.

LUVARUS IMPERIALIS, Rafinesque. (Figure 230.)

Luvarus imperialis, Rafinesque, *loc. cit.;* Ind. It. Sicil. 319, pl. I, fig. 1.—Bonaparte, Catalogo Metodico, No. 700.—Cuvier and Valenciennes, Hist. Nat. Poiss., IX, 412.—Giglioli, Elenco, 26.—Moreau, Hist. Nat. Poiss. France, II, 511.—Day, Fish. Gt. Britain and Ireland, I, 121, pl. XLIII.
Coryphæna elegans, Risso, Mem. prés l'Inst., 1814 (young).
Diana semilunata, Risso, Hist. Nat. Eur. Mérid., 1826, III, 341 (young).—Günther, Cat. Fish. Brit. Mus., II, 413.—Steindachner, Ichth. Spain and Portugal, 1868, 31.
Ausonia Cuvieri, Risso, *op. cit.*, 342, pl. XXVIII.—Lowe, Proc. Zoöl. Soc., London, 1843, 1884.—Bonaparte, *op. cit.* No. 679.—Günther, *op. cit.*, 414; Proc. Zoöl. Soc., 1886, 336, with figure of skeleton.—Canestrini, Fauna Italica, Pesci, 108.—Couch, Proc. Zoöl. Soc., London, 1866, 332, figure.—Steindachner, *op. cit.*, 31.
Proctostegus proctostegus, Nardo, Prodr. Obs. et Disq. Adriat. Ichth. in Diar. Phys. Chem. et Nat. Ticini, I, 1827, 18, 42.
Proctostegus prototypus, Nardo, *op. cit.*, with figure.
Astrodermus coryphænoides, Cuvier and Valenciennes *op. cit.*, IX, 353, pl. CCIXX.—Swainson, Fishes, II, 255.—Lowe, Proc. Zoöl. Soc., 1840, 37; Trans. Zoöl. Soc., III, 7.
Astrodermus Valenciennesi, Cocco, Giorn. Sci. Lett. Art. Sic., 153, figure.
Astroderma plumbeum, Lowe, Proc. Zoöl. Soc., 1843, 83.
Astrodermus elegans, Bonaparte, Fauna Italica, Pesci, figure.—Canestrini, *op. cit.*, 108.—Moreau *op. cit.*, 514.
Ausonia Cocksii, Couch, Ann. and Mag. Nat. Hist., XVIII, 1866, 424; Cornish Zoölogy, 1866, 500.—Bullmore, Jour. Royal Institute of Cornwall, 1866, No. VI, 61, figure.

This fish was originally described from a specimen 5 feet long seen by Rafinesque at Solanto, Sicily, June 15, 1808. It has since been observed at Nice, in the Adriatic and at Malta and Elba, and at Cette, whence came the beautiful specimen which we have seen in the Museo Civico of Genoa.

Prof. Giglioli was the first to point out the interesting series of metamorphoses by which *Astrodermus* and *Diana* develop into *Ausonia* and *Luvarus*.

Lowe observed both young and old at Madeira, and Steindachner found it on the coast of Spain. Two were thrown ashore on the Cornish coast in 1866, and from one of these, 45 inches long, Day had made the excellent figure for his "Fishes of Great Britain and Ireland."

Family LAMPRIDIDÆ.

Lamprididæ, Gill, Arr. Fam. Fishes, 1872, 7 (No. 87); Johnson's Cyclopædia, II, 1621.—Jordan and Gilbert, Bull. XVI, U. S. N. M., 453.

Scombroidea with an oval, much compressed body; scales small, deciduous, mouth small. Teeth absent in adults. Branchiostegal rays six; dorsal and anal fins long, undivided; ventral fins multiradiate, subabdominal. Pyloric cæca numerous. Air bladder large and posteriorly bifurcate. (*Gill.*)

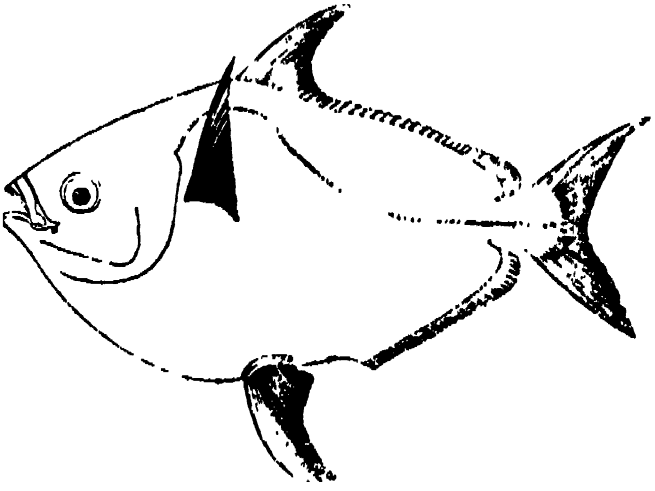
LAMPRIS, Retzius.

Lampris, RETZIUS, Nya Handlung, III, 1799, 91.—CUVIER, Règne Animal, 1st ed., 1817, 325.—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 415.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 453.
Chrysotosus, LACÉPÈDE, Hist. Nat. Poiss., IV, 586.

Body compressed and elevated, covered with very small deciduous, cycloid scales. Mouth narrow, terminal, with no teeth. Dorsal single, very long, elevated, falcate, without distinct spines; anal long, low, not falcate, both fins depressed in a groove. Ventrals behind pectorals (14 to 17 rays), pectorals large, falcate; caudal fin moderately forked. Lateral line present, much arched in front. Branchiostegals, 6. Gill membranes free from the isthmus. Œsophagus not armed with spinous teeth. Air bladder large, bifurcate behind. Pyloric appendages very numerous. Vertebræ 45.

LAMPRIS REGIUS, (BONNATERRE), RETZ.

Zeus regius, BONNATERRE, Ichthyologie, 1788, p. 72, pl. XXXIX, fig. 155.
Zeus guttatus, BRÜNNICH, Dansk. Selsk. Skr., III, 1788, 398.
Zeus luna, GMELIN, Syst. Nat., 1788, 1225.
Lampris luna, GÜNTHER, *op. cit.*, II, 416.—CUV. and VAL., *op. cit.*, X, 39.
Lampris lauta, LOWE, Fish. Madeira, 27.



LAMPRIS REGIUS.

Longest dorsal ray shorter than pectorals, which are nearly as long as the head. Anal very low in front, a little higher behind. Head, 3¼; depth, 1⅘.

Radial formula: D. 54; A. 40; V. 14–17; Vert. 23+22; L. 3–4 feet.

Color, a rich brocade of silver and lilac, rosy on the belly; everywhere with round silvery spots; head, opercles, and back with ultramarine tints, jaws and fins vermillion; flesh red.

This form, exceedingly rare in the Mediterranean, has occasionally during the last century been found along the coasts of Europe as far north as Norway, also about Madeira and Iceland; it had been reported from off Newfoundland, Nova Scotia (?), and Maine; no specimen from the Atlantic had been in the possession of any American museum, when a specimen was taken by schooner *Mildred V. Lee*, Capt. William T. Lee, off Le Have ridges, between 62° and 63° lon. W., 42° and 49° lat. N.

A specimen from Japan in the U. S. National Museum is apparently of the same species. We are not aware that this has hitherto been recorded from the Pacific. There is every reason to believe that the fish is at times an inhabitant of considerable depths.

Family ZEIDÆ.

Zenidæ, LOWE, Proc. Zoöl. Soc., London, 1839, 82.
Zenidæ, GILL, Proc. Acad. Nat. Sci., Phila., 1862, 126; Arr. Families Fishes, 1872, 8 (Fam. No. 84).—JORDAN and GILBERT, Bull. XVI., U. S. Nat. Mus., 458.
Zeina, SWAINSON, Nat. Hist. Fish., etc., 1839, II, 176.
Zeini, BONAPARTE, Cat. Metodico, Pesci Europe, 1876, 75.
Zeoidei, BLEEKER, Tentamen, 1859, XXIII.
Zeidæ, GILL, MS.
Cyttina, GÜNTHER, Cat. Fish. Brit. Mus., II, 393.
Cyttidæ, GÜNTHER, Introduction to the Study of Fishes, 1880, 450.

Scombroidea, with a high, short, deep, much compressed, and elevated body. Lateral line obscure, unarmed. Scales minute, absent, or replaced by bony protuberances. Mouth large, terminal, with upper jaw protractile, and teeth small, in narrow bands or single series, on jaws and vomer, and sometimes on palatines. Eyes lateral. Opercles and other bones about the head often armed with spines. Branchiostegals, 7 or 8. Gill membranes little united, free from the isthmus. Gill rakers usually short. Gills 4, a slit behind the fourth. Pseudobranchiæ large. Dorsal emarginate, or divided, with strong spines anteriorly, the posterior part longer. Anal spined or spineless. Ventrals thoracic, with one spine and five to eight rays. Caudal usually not forked. Pyloric cæca exceedingly numerous. Air bladder large. Vertebræ about 32.

KEY TO THE GENERA AND DEEP-SEA SPECIES.

I. Bony plates along the bases of the vertical fins, and between ventrals and anal on median line of body .... ZEINÆ
A. Plates at bases of second dorsal and anal. Anal spines 4 .... ZEUS
B. Plates at bases of first and second dorsal and anal. Anal spines 3 .... ZENOPSIS
1. Ventral spines, 3 .... *Z. ocellatus*
II. No bony plates at base of vertical fins .... CYTTINÆ
A. No bony plates on ventral line .... CYTTUS
1. Ventrals receivable in sheath on abdomen.
a. Ventral spines, 2 .... *Cyttus australis*
2. Ventrals not receivable in sheath.
a. Ventral spines, 2 .... *Cyttus abbreviatus*
b. Ventral spines, 2 .... *Cyttus hololepis*
B. Bony plates between ventral and anal, on median line of body .... CYTTOPSIS
1. Body partially naked .... *Cyttopsis roseus*
III. Numerous large, conical, bony protuberances, symmetrically arranged .... OREOSOMINÆ
A. About four protuberances on the back and twenty below .... OREOSOMA

ZENOPSIS, Gill.

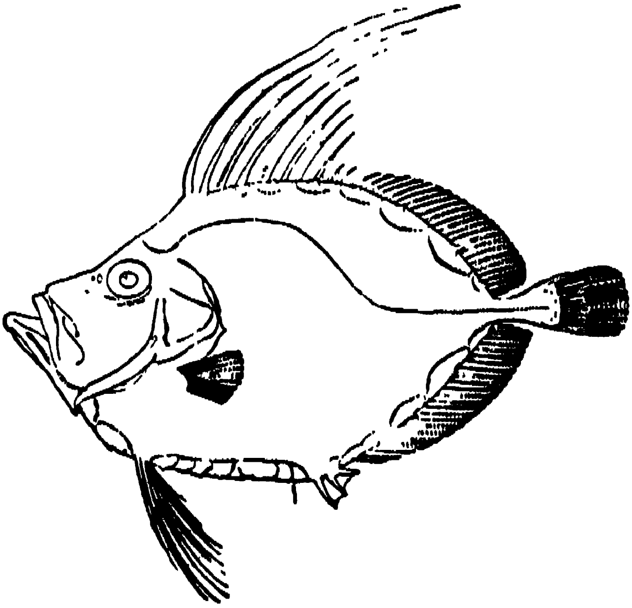
Zenopsis, GILL, Proc. Acad. Nat. Sci. Phila. 1862, 126 (type, *Zeus nebulosus*, Temminck and Schlegel, from Japan).

Body ovate, much compressed, without scales, not warty. Head deeper than long, its anterior profile steep. Mouth rather large, upper jaw protractile; teeth small, on jaws and vomer, none on the palatines. Various bones of the head and shoulder girdle armed with spines. Series of bony plates along the sides of the belly and the bases of the dorsal and anal, each plate armed with a strong spine. Eye large, placed high. Gill-rakers short. Dorsal spines very strong, usually 10 in number. Anal spines 3. Ventral fins long, mostly I, 7. Caudal peduncle slender, the fin not forked. Two or three species known, differing from *Zeus*, mainly in the presence of 3 anal spines instead of 4. Pelagic.

ZENOPSIS OCELLATUS, (STORER), GILL.

Zeus ocellatus, STORER, Proc. Boston Society Nat. Hist., VI, 388.
Zenopsis ocellatus, GILL, Proc. Acad. Nat. Sci., Phila., 1862, 126.

Color silvery, nearly plain; a black lateral ocellated spot in life, disappearing in spirits. Body short, deep, compressed. Skin wholly naked, except for the bony bucklers, which are armed each with a central spine hooked backwards and marked with radiating ridges; 7 bucklers along the base of the dorsal. the fifth and sixth largest; 2 on the median line in front of the ventrals, the second largest; one median plate, and 6 pairs between ventrals and anal, and 4 along the base of the anal. Top of the head with roughish ridges, but without spines; a spine at the base of each dentary bone; the broad maxillaries each with a supplemental bone; teeth nearly obsolete. Eye large, much nearer the gill opening than the tip of the snout. Gill-rakers short. Caudal peduncle very slender, the caudal fin short and rounded; pectorals very short; ventrals large, the rays I, 6, the first soft ray closely appressed to the spine; anal spines short and stout, the soft rays, like those of the dorsal, low; dorsal spines filamentous. D. IX, 26; A. III, 24. Pelagic; one specimen taken at Provincetown, Mass. (Description from the original type,by Jordan.)



ZENOPSIS OCELLATUS.

Zenopsis conchifer, (Lowe), is closely allied to this species and is a pelagic form. No evidence has as yet been found of its occurrence below the surface.

CYTTUS, Gunther.

Cyttus, GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, p. 396.

Body compressed and elevated, covered with very small scales; mouth protractile. Two contiguous dorsal fins, the first with eight or nine spines, the anal with two short spines. No bony plates along the base of the dorsal and anal fins. Ventral fins composed of one spine and six or eight soft rays. Minute teeth in the jaws and on the vomer, none on the palatine bones. Branchiostegals, eight.

The type is *Cyttus australis* (*Capros australis*, Richardson), from Australian seas. *C. abbreviatus*, Hector (Günther, Challenger Report, XXII, p. 22, Pl. x, fig. B), was obtained in 400 fathoms some 200 miles off Cape Farewell, New Zealand. *C. hololepis*, described below, was obtained in 220 fathoms. It is fair to assume then, since two out of three of the known species are found in deep waters, that *C. australis* also descends to the depths.

CYTTUS HOLOLEPIS, GOODE and BEAN, n. s. (Figures 233, 233*a*, 233*b*.)

The greatest depth of the body, which is at the ventral origin, is two-fifths of the total without caudal. The length of the head is three-eighths of the standard length. The eye is very large, equal to two-ninths of the length without caudal, and more than one-half the length of the head. The width of the interorbital space, 9 millimeters, is two-fifths of the length of the head. The intermaxillary is protractile and when drawn out a deep horseshoe-shaped groove is exposed between the orbits. The length of the intermaxilla (8 millimeters) is one-half that of the head without the snout. The maxilla is thin, broad, obtuse at the extremity; its length (9 millimeters) equal to that of the interorbital area. The length of the mandible (10 millimeters) is nearly one-half that of the head. The mouth is almost vertical when closed. The quadrate bone ends posteriorly in a broad, obtuse spine; it has several ridges with minute cirri. The supraorbital, also, has several minutely cirrated ridges.

Teeth in the jaws so minute as to be indistinguishable except to the touch. The nostrils are placed close to the front of the eye and somewhat above its middle; the posterior is much the larger; it is a spear-shaped slit about three times as long as the anterior.

Pseudobranchiæ well developed; 14 or 15 very small lanceolate gill-rakers below the angle on the first arch. The gill-openings are very wide, the membranes very deeply cleft and only narrowly attached to the isthmus in front. Branchiostegals 8.

The dorsal and ventral origins are in the same vertical.

The distance of the spinous dorsal from the snout is equal to the greatest height of the body. The spinous dorsal contains 6 or 7 spines, the first of which is minute, about one-fourth as long as the second, which is as long as the eye. The second spine is finely serrated in the middle of its anterior margin and is dilated at the root so as to partly conceal the base of the third spine.

The rays of the soft dorsal increase in size backwards, the first being only one-third as long as the last, which is about one-fourth as long as the head. The longest rays of the soft dorsal are about the nineteenth to the twenty-fourth; these are slightly longer than the last. The caudal is almost truncate or very slightly rounded when expanded. Its middle rays are nearly as long as the eye.

The vent is under the fifth ray of the second dorsal, and the anal origin under the sixth ray. The anal rays, also, increase in size backwards but the longest are not more than three-fourths as long as those of the dorsal. The rays of the soft dorsal and anal are all simple and articulated. The length of the ventral spine is one-fourth of the standard length; it exceeds that of the longest ventral ray. The ventral when fully expanded is subtriangular; the spine is minutely serrated on its anterior margin. The pectoral is subcircular when expanded and is composed entirely of simple articulated rays, the longest, in the middle of the fin, one-half as long as the eye. There are about 10 rows of scales between the lateral line and the base of the spinous dorsal, and about 67 in the lateral line.

Radial formula: D. VI–VII, 26; A. 23; V. I, 6; P. 16.

The types of the description are a single individual, No. 39296, taken by the *Albatross* at station 2358, N. lat. 20° 19′, W. lon. 87° 03′ 30″, in 220 fathoms, off Yucatan, and two specimens, No. 39297, from *Albatross*, station 2655, N. lat. 27° 22′, W. lon. 78° 07′ 30″, 338 fathoms, Little Bahama Bank.

The species is a true *Cyttus*, resembling the southern species, but with a single preanal spine, fewer rays in the vertical fins, and with the body entirely scaled. The plates at the dorsal and anal bases are well developed.

No. 39296 is 75 millimeters long, and the larger specimen of No. 39297 is 86 millimeters long, while the length of the smaller is 80 millimeters.

CYTTOPSIS, Gill.

Cyttopsis, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 126 (type, *Zeus roseus*, LOWE).

A genus of *Zeidæ* without bony plates at the bases of the vertical fins, but with a series of shields on the ventral line between the ventral and the anal fins. Body much compressed, elevated, partially naked. Teeth minute in bands, in the jaws, and on the vomer. Branchiostegals 7. Ventrals I, 7.

CYTTOPSIS ROSEUS, (LOWE), GILL.

Zeus roseus, LOWE, Proc. Zoöl. Soc. London, 1843, 85.
Cyttus roseus, GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, 396.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 349.
Cyttopsis roseus, GILL, *loc. cit.*

A *Cyttopsis* resembling in general appearance *Zeus faber*. Height of body one-half its length; its thickness one-eighth of the same; length of head two-fifths of length of body. Snout more than half as long as the head, though the maxillary, on account of its nearly vertical position, reaches scarcely to the vertical from the anterior margin of the orbit. Teeth small, in villiform bands on the intermaxillaries, mandible, and vomer. Eye very large, its diameter one-third the length of the head; the upper orbital margin provided with a series of saw-like teeth, pointed forward, nearly 30 in number, the five or six most anterior more developed than the others, which can only be seen with the lens; interorbital space slightly concave, striated. Gill opening wide. Vent slightly postmedian. Scales present only in the lateral line and its immediate neighborhood. Three or four bony plates between the ventrals and the vent, the anterior ones armed with very strong spines, pointing backward. At the base of the dorsal and anal fins a series of little nodules, corresponding to the interspinous spaces.

Dorsal occupying a large part of the length of the back, its spines very robust; the third, the strongest, is in length equal to one third the height of the body; the first eight or ten soft rays increase in size, the first being the lowest; they are farther apart than those which follow them and are united by a membrane only at their base. Anal very similar to the soft portion of the dorsal; the first spine stout and immovable. The caudal peduncle is widened at its extremity and the caudal is abruptly truncate. Pectorals moderate, obtuse, composed of 13 rays. Ventrals remarkably long, inserted nearly in the vertical from the insertion of the pectorals, and extending behind the anal spine; the two branches which form each ray are very distinct, even from the base, as in *Trigla* and similar fishes.

Radial formula: D. VIII, 27; A. I, 25; V. I, 7; Br. VII.

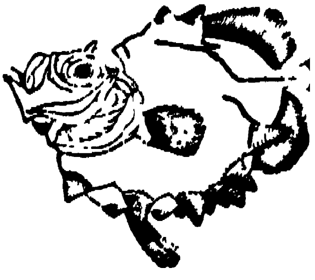
Scales in lateral line 53, in transverse line 9-10.

Color silvery, passing into roseate above and below. Fins yellowish; the ventrals have the membrane black and the rays milky white.

This species was originally described by Lowe from Madeira, and his specimen, eleven inches in length, now in the British Museum, is believed to be the type. The *Travailleur* obtained two specimens from the coast of Morocco, Station LXIX, at a depth of 410 meters

OREOSOMA, Cuvier and Valenciennes.

Oreosoma, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 515.—GÜNTHER, Cat. Fish. Brit. Mus., I, 214; II, 396.—LOWE, Fishes of Madeira, preface, xii.



OREOSOMA (After C. & V.).

Zeids with an elevated body and 2 dorsal fins, the first with 5 spines. A long anal, composed entirely of rays. Opercles unarmed; operculum with two ridges terminating in flat angles. Villiform teeth on jaws, vomer, and palatines. No scales, but numerous large, conical, bony protuberances, symmetrically arranged.

OREOSOMA ATLANTICUM, CUVIER and VALENCIENNES.

Oreosoma atlanticum, CUVIER and VALENCIENNES, *loc. cit.*, pl. XCIX.—GÜNTHER, *loc. cit.*

An *Oreosoma*, described as having 25 or 26 large, conical, bony protuberances, four of which are on the back.

Radial formula: D. v, 29; A. 26; v. I, 5.

This remarkable form is known only from a single specimen, obtained by Peron, the French navigator, in "the Atlantic Ocean." It was probably taken in the surface net. The type is 16 lines in length. A full description is given by Cuvier and Valenciennes, who refer to it as a little fish, whose height is equal to its length; covered with great cones, so rugged and bold that a drawing of it resembles a map of a volcanic country.

Its affinities are believed by some ichthyologists to be Berycoid.

Family CAPROIDÆ.

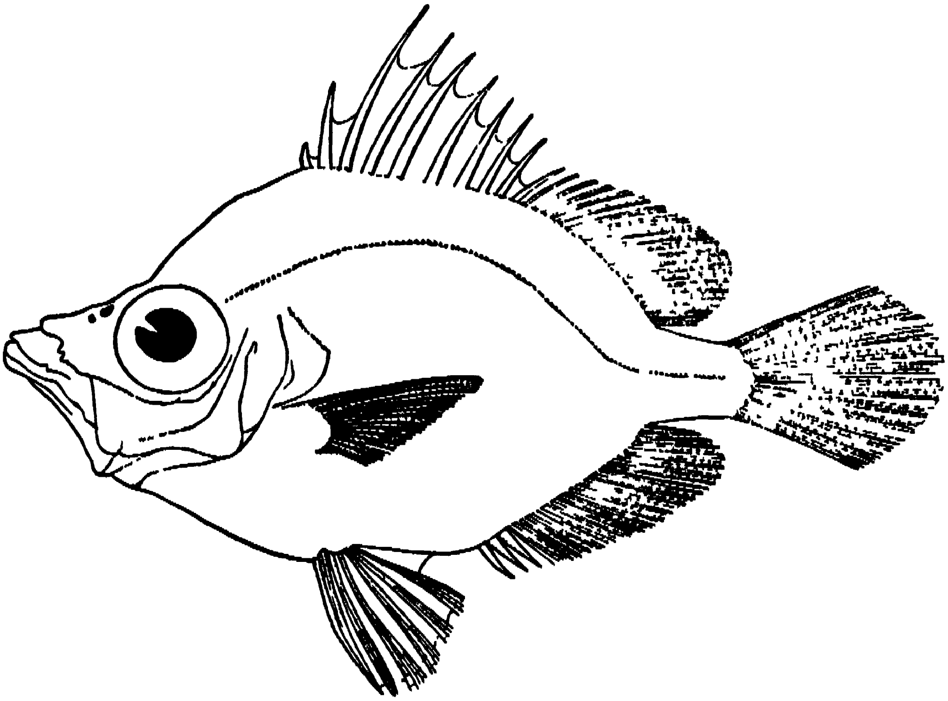
Capridæ, LOWE, Fishes of Madeira, XII, 1813.—GILL, Arrangement of the Families of Fishes, 1872, 9. (No. 90.)

Caproidæ, GILL, Century Dictionary, 809.

Scombroidea with compressed and elevated body, covered with small, ctenoid scales; upper jaw protractile; vertebræ very numerous; dorsal in two parts; ventrals with 1 spine and 5 rays; teeth very small.

KEY TO THE GENERA.

I. Mouth very protractile; teeth in jaws, vomer, and palatines...... ....CAPROS
II. Mouth less protractile; teeth in jaws ....ANTIGONIA



CAPROS APER (after Cuvier)

CAPROS, Lacepede.

Capros, LACÉPÈDE, Hist. Nat. Poiss., IV, p. 590.—CUVIER & VALENCIENNES, Hist. Nat. Poiss., X, p. 29.—GILL, Proc. Acad. Nat. Sci., Phila., 1862, p. 127.

Body compressed and elevated; mouth very protractile. Scales rather small, spiny. Two contiguous dorsals, the first with 9 spines, the anal with 3. No bony plates along the base of the dorsal and anal fins. Ventral fins composed of 1 spine and 5 rays. Minute teeth in the jaws and on the vomer, none on the palatine bones. Branchiostegals 5; air-bladder large. Pyloric appendages in small number. (*Günther.*)

CAPROS APER, (LINNÆUS), LACÉPÈDE.

Zeus aper, LINNÆUS, Syst. Nat., ed. x, 1758, I, 266.
Capros aper, LACÉPÈDE, Hist. Nat. Poiss., IV, p. 591.—GÜNTHER, Cat. Fish. Brit. Mus., II, p. 496.—VAILLANT, Exp. Sci. Travailleur et Talisman, Poiss., 1888, 353.

A *Capros* with upper and lower profiles of the snout concave, with small scales, with strong spines in the dorsal and ventral fins. Adults usually brownish red; young, some grayish, others red approaching vermillion on the upper parts, silvery white below; iris golden, with some red spots.

Radial formula: D. IX, 23/24; A. III/23; V. I/5; Cæc. pylor. 2; Vert. 10–12/13.

The Boarfish of English authors is said to be common in the Mediterranean, and has also been found in the waters of Madeira; stragglers have a few times been taken on the south coast of England and Ireland; the French explorers found it at various depths from 30 to 175 fathoms in the Gulf of Gascogne, on the coast of Morocco, Soudan, and Spain, and on the Banc D'Arguin. It is one of those forms which, while more especially characteristic of the shore fauna, descends into moderately deep waters adjacent, and is by courtesy admitted to the deep-sea lists, especially since the other members of the same family are characteristic deep-water forms, and, in the opinion of Dr. Günther, but rarely come to the surface.

ANTIGONIA, Lowe.

Antigonia, LOWE, Proc. Zoöl. Soc. London, 1843, 85.
Caprophonus, MÜLLER and TROSCHEL, Horæ Ichthyologicæ, III, 28.

Body very compressed and elevated, covered with rather small spiny scales; mouth little protractile. Dorsal fin continuous, with 8 spines; 3 anal spines, remote from the soft portion. Ventral fins composed of 1 spine and 5 rays. Very small teeth in the jaws. Branchiostegals 5 to 7. (*Günther.*)

ANTIGONIA CAPROS, LOWE. (Figure 235.)

Antigonia capros, LOWE, Proc. Zoöl. Soc Lond., 1843, 85.—GÜNTHER, Cat. Fish. Brit. Mus., II, 497; Challenger Report, XXI, 1887, 44.—STEINDACHNER, Denkschr. Akad. Wiss. Wien, XLIX, 1884, 187, pl. V.
Caprophonus aurora, MÜLLER and TROSCHEL, Horæ Ichthyologicæ, III, p. XXVIII, taf. V, fig. 1.
Hypsinotus rubescens, SCHLEGEL, Fauna Japonica, Poissons, 84, pl. XLII, fig. 2.—GÜNTHER, Report on the Shore Fishes, Chall. Report, part VI, 44. (Young.)
Antigonia Mülleri, KLUNZINGER, Sitzb. Akad. Wiss. Wien, LXXXIII, 1879, 380, pl. V, fig 3.

An *Antigonia* with the height of the body five sixths of its total length, and a very strong striated ventral spine. Color red. (*Günther.*)

Radial formula: D. VIII, 34; A. III, 32–33; V. I, 5; B. 5–7.

Antigonia capros is a cosmopolitan form, first known from the mid-Atlantic, off Barbados and Madeira; since obtained in Japan, near the Ki Islands and Manado. The greatest depth at which it has been taken is 129 fathoms, off the Ki Islands.

Family TETRAGONURIDÆ.

Les Tetragonurides, RISSO, Hist. Nat. Eur. Mérid., III, 1829, 381.
Tetragonuridæ, BONAPARTE, Saggio, 1837; Catalogo Metodico, 1846, 72.
Tetragonurina, GÜNTHER, Cat. Fish. Brit. Mus., III, 407.

Scombroidea with long, slender body, covered with hard, ciliated, grooved scales, which are very adherent. A dorsal divided into two portions, closely connected, the soft part shorter and higher. Mouth subvertical; teeth in jaws in single series and on palate. Air-bladder none.

TETRAGONURUS, Risso.

Tetragonurus, Risso, Ichth. Nice, 1810, 347; Hist. Nat., III, 381.—Günther, *loc. cit.*—Moreau, Hist. Nat. Poiss. France, III, 178.

Body subcylindrical, elongate. Snout obtuse. Ventrals abdominal, placed below middle of pectoral.

TETRAGONURUS CUVIERI, Risso. (Figure 417.)

Corvus niloticus, Aldrovandi, De Piscibus, V, cap. 25, 28.
Tetragonurus Cuvieri, Risso, Ichth. Nice, 1810, 347; Hist. Nat. Eur. Mérid., 1829, III, 381.
Tetragonurus atlanticus, Lowe, Fishes Madeira, 129, pl. XIX.

Spinous dorsal low, receivable in groove. Scales each with 5 to 6 keels, each terminating in a spine. Color, brown, with violet and yellow reflections.

Radial formula: D. XV–XXI, I, 11–13; A. 10–12; L. lat. 118/20.

This form was originally described from Nice. Risso says that it lives at great depths, approaching the coast only in August at the time of spawning, and that its natation is slow and feeble. It has since been found off Toulon and Marseilles, and by Lowe near Madeira, where it was taken swimming at the surface. Lowe is also of the opinion that it occurs at very great depths. Its flesh when eaten is a violent poison, as was demonstrated by the personal experience of Risso himself. A single specimen was obtained by the U. S. Fish Commission at Wood's Holl, Massachusetts, November 10, 1890 (Cat. No. 44436, U. S. N. M.).

Family CHILODIPTERIDÆ.

Chilodipteroidei, Bleeker, Tentamen, 1859, XX.
Chilodipteridæ, Gill, Arrangement, Families of Fishes, 1872.
Apogonina, Günther, Cat. Fish. Brit. Mus., I, 1859, 57, 222.
Apogonidæ, Jordan & Gilbert, Bull. XVI, U. S. Nat. Mus., 1883, 563.

Percoidea, with body oblong, more or less elevated, covered with large deciduous scales (striated and ctenoid, or sometimes cycloid); cheeks scaly; cleft of mouth wide, oblique. Villiform teeth on jaws and vomer, and sometimes on palatines (teeth absent in *Brephostoma*); canines sometimes present; preoperculum commonly with a double ridge; its edge entire or slightly serrated; lower pharyngeals separate, with sharp teeth; pseudobranchiæ present; branchiostegals 7, or less; dorsal fins well separated, the first with 6 to 9 rather strong spines; anal fin short, with 1 to 3 (usually with 2) spines; ventral fins thoracic, I, 5.

KEY TO THE DEEP-SEA GENERA OF CHILODIPTERIDÆ.

(*Provisional—including some genera of doubtful relationship.*)

I. Canine teeth at the outer side of the villiform bands in the jaws.
A. Preoperculum with a double serrated edge; anal with two spines.
1. Dorsal with six spines; operculum unarmed.................................(Chilodipterus)
2. Dorsal with nine spines; operculum with two weak spines.................... Parascombrops
II. Teeth all villiform; no canines.
A. Lateral line normal.
1. Palatines with teeth.
a. Anal with two spines.
Preoperculum with double serrated ridge ....(Apogon)
Preoperculum with double entire ridge.
Scales large, 20–26 in lateral line ....(Apogonichthys)
Scales small, 40 or more in lateral line.................................... Glossamia
b. Anal with three spines; bones of head cavernous.
Preoperculum denticulated; operculum with two feeble points.
Scales small, 45 in lateral line .... Malacichthys
2. Palatines toothless.
a. Preoperculum with striated angle. Teeth moderate. B. VII...................... Epigonus
b. Preoperculum with one spine. Teeth rudimentary on jaws. "B. IV" .... Pomatomichthys
B. Lateral line beginning under origin of second dorsal.
1. Anal with two spines... Microichthys

III. Teeth absent.
  A. Head large, unarmed. Preoperculum with a double edge.
    1. Anal with 1 spine .... BREPHOSTOMA

PARASCOMBROPS, Alcock.

Parascombrops, ALCOCK, Journal Asiatic Society of Bengal, LVIII, II, 1889, 297.

Chilodipterids with body elevated and a wide, oblique mouth. Preoperculum with a double border, the outer border recurved at its angle and strongly serrated at this point, as well as along its horizontal limb; the inner border with 3 small spines at its angle. Operculum arched, with 2 weak spines, and with a membranaceous extension of its angle. Teeth villiform in jaws (in front), vomer, and palatines; 2 small canines in upper jaw, and several large teeth in lower one. Tongue smooth. First dorsal with 9 spines, anal with 2. Scales large, excessively deciduous (28 in lateral line in type species). Pseudobranchiæ present. Branchiostegals VII.

A single species, *P. pellucidus*, Alcock (*loc. cit.*), from the Bay of Bengal, 98 to 102 fathoms, and from near the Deir mouth of the Mahanadi Delta, in 65 to 68 fathoms. Dr. Alcock says that its facies is "decidedly bathybial."

GLOSSAMIA, Gill.

Glossamia, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 82.

Chilodipterids with body somewhat elevated and an oblique mouth. Preoperculum with a double, unserrated ridge. Operculum armed. Teeth uniform, villiform, on the jaws palatines and vomer. Tongue smooth. First dorsal with 6 or 7 spines; anal with 2 spines and 7 to 9 rays. Scales small, deciduous, 40 or more in lateral line. No pseudobranchiæ. Branchiostegals 7.

The type is *Apogon aprion*, Richardson (Ann. Nat. Hist., 1842, IX, 16; *Apogonichthys aprion*, Günther, Cat., I, 247).

GLOSSAMIA PANDIONIS, GOODE and BEAN. (Figure 231).

Apogon pandionis, GOODE and BEAN, Proc. U. S. Nat. Mus., IV, 1881, 160.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 564.

Body oblong, rather robust, its greatest width (behind the gills) being equal to half the length of the head, and contained six times in the length of the body without caudal; its greatest height contained about thrice and two-thirds in the body length. Least height of tail almost equal to half the greatest height of the body. Scales small, cycloid, 45 in the lateral line; 3 longitudinal rows above and 9 below the lateral line; lateral line complete.

Length of the head one-third of the standard length of the body, its greatest width equal to greatest width of body. Length of the snout 4½ times in length of head. Maxilla extends to a point a very little behind the anterior margin of the pupil, the mandible to the vertical from the middle of the eye. Length of maxilla equal to long diameter of the eye. Preoperculum apparently unarmed. Operculum with two flexible points near its upper angle. Gill-rakers long and slender.

Eye nearly circular, its longest diameter nearly equals half the length of the head and is contained 7 times in the standard body length, nearly horizontal. Width of interorbital space equals two-thirds the diameter of the eye. Mouth oblique, the lower jaw projecting. Dentition in jaws hardly perceptible. Feeble teeth on the head of the vomer and on the palatine bones.

Distance of dorsal from snout equal to twice the greatest width of the body; its longest spine (fourth) equal in length to three-fourths of the diameter of the eye. Distance from origin of first dorsal to origin of second dorsal equal to twice the length of the base of the latter. Distance of anal from snout equal to twice the length of the head; the length of its base is equal to two-thirds the length of the eye; of its longest ray to the length of the maxilla. First anal spine minute, its length equal to one-fourth of the least height of tail;

the second anal spine at least twice as long as the first. Caudal deeply furcate, scaled upon the lower portions of the lobes.

Distance of pectoral from snout equal to length of head; its length equal to that of the maxilla.

Distance of ventral from snout slightly greater than one-third of the standard body length.

Radial formula: D. VII, 1, 9; A. II, 8; P. 16; V. I, 5.

Scales in lateral line, 45; above lateral line, 3; below, 9.

Color nearly uniform light, reddish brown, with no blotches. Scales finely punctulate with black.

Our description is based upon Museum specimen No. 26228, taken by the *Fish Hawk* from station 897, in 37° 25′ N. lat., 74° 18′ W. lon., at a depth of 157½ fathoms. Examples were also obtained by the *Albatross* from station 2376, in 29° 13′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms; and from station 2398, in 28° 45′ N. lat., 86° 26′ W. lon., at a depth of 227 fathoms.

MALACICHTHYS, Döderlein.

Malakichthys, Döderlein, Denkschr. d. k. Akad. d. Wiss. Wien, XLVII, 1883, 240 (type, *M. griseus, loc. cit.*, pl. II, fig. 1).—Günther, Challenger Report, XXII, 1887, 15.

Form of the body oval, similar to *Ambassis*. The two dorsals united by a low membrane; anal with 3 spines. Preoperculum denticulated; operculum with 2 feeble points. Bones of the head very thin, cavernous; eye large. Very narrow bands of villiform teeth in the jaws, on the vomer and palatine bones, without canines. Head nearly entirely scaly. Mouth wide, oblique, with projecting mandible. Scales of moderate size, ctenoid, deciduous. Seven branchiostegals; pseudobranchiæ. Lateral line complete; Pyloric appendages in small number (4). Air bladder small. Abdominal cavity and pharynx black. (*Günther.*)

The type species *Malacichthys griseus* is represented by several specimens taken near Tokio, Japan, and said by Döderlein to be obtained at great depths.

EPIGONUS, Rafinesque.

Epigonus, Rafinesque, Appendice, 64.

Pomatomus, Risso, Ichthyologie de Nice, 1810, 301: Hist. Nat. Europe Méridionale, III, 387.—Cuvier and Valenciennes, Hist. Nat. Poiss., II, 171.—Günther, Cat. Fish. Brit. Mus., I, 249.—Moreau, Hist. Nat. Poiss., France, II, 385.

Chilodipterids with the body elongate, thick, covered with large, deciduous scales. Head large, entirely covered with scales. No keels. Operculum with 2 feeble points. Preoperculum with prominent, rounded and striated angle, but with its posterior limb emarginate. Eyes very large. Teeth villiform. No teeth on the palatines. Two dorsal fins, separated by an interspace; the first with 7 spines. Anal with 2 spines. The fins more or less scaly. Pyloric cæca numerous.

The name *Pomatomus* is preoccupied, having been applied by Lacépède to a fish usually known to European ichthyologists as *Temnodon*.

EPIGONUS TELESCOPUS, (Risso), Goode and Bean.

Pomatomus telescopus, Risso, Ichthyologie, 1810, 301, Pl. IX, fig. 31; Hist. Nat. Europe Méridionale, 387.—Lowe, Trans. Zoöl. Soc., II, 173.—Bonaparte, Cat. Metodico, No. 488.

Pomatomus telescopium, Cuvier and Valenciennes, *loc. cit.*, II, 171, Pl. XXIV; VI, 495.—Cuvier, Règne Animal, Illustrée, Pl. VII, *a*, fig. 1.—Guichenot, Explor. Algor. Poiss., 32.—Valenciennes, in Webb and Berthélot, Hist. Nat. Iles Canaries, Ichthyol., pl. I.—Günther, Cat. Fish. Brit. Mus., I, 250.—Canestrini, Fauna Italica, 179.—Moreau, Hist. Nat. Poiss. France, II, 386.

Pomatomus Cuvieri, Cocco, Giorn. Sci. de Sicilia, VII, 1829, 143, figure.

The fish described in 1810 by Risso was said to be so rare that during thirty years previous only two specimens had been taken. "This rarity," says Risso, "is due to the fact that it never leaves those cold submarine valleys where our fishermen can only set their long lines in the month of August, so that they are never taken except by chance."

"Its chief characteristics," he continues, "are its globular eyes of extraordinary dimensions, its large and strong fins, the powers of rapid swimming, and a generally vigorous and active constitution. All these characteristics are necessary for its defense against the oceanic animals which frequent the marine abysses in which it customarily lives."

It has since been taken about Nice, Genoa, and Naples, and also at Messina. Canestrini says that it spawns in the spring.

EPIGONUS OCCIDENTALIS, Goode and Bean, n. s. (Figure 236.)

The greatest height of the body at the ventrals (17 millimeters in the type specimen) is contained a little over seven times in the length without caudal. The least height of the tail (7 millimeters) equals the width of the interorbital space measured on the bone. The length of the head (39 millimeters) is nearly one-third of the total without caudal. The greatest width of the head (20 millimeters) is about one-half its length. The long diameter of the eye (17 millimeters) is contained seven times in the standard length and is nearly one-half the length of the head. The length of the snout (9 millimeters) is about one-half that of the eye. The maxilla reaches somewhat beyond the anterior margin of the orbit; its length (14 millimeters) equals one-half the length of the head without the snout. The intermaxilla is short and thin, its length (9 millimeters) about equal to that of the snout; its connection with the tip of the maxilla is ligamentous. The mandible reaches nearly to below the middle of the eye; its length (18 millimeters) about equal to that of the eye. The posterior nostril is very slightly in advance of the front of the eye; the anterior nostril is a little nearer to the eye than to the tip of the snout. Both pairs of nostrils are superior rather than lateral. The groove for the intermaxillary process is naked, narrow; its length (5 millimeters) equal to twice its width. A weak spine on the operculum. The pseudobranchiæ are well developed. Sixteen gill-rakers below the angle; the longest (5 millimeters) about one-third the length of the maxilla. Weak villiform teeth in very narrow bands on the intermaxilliary and mandible. Vomer and palatines toothless.

The dorsal begins over the eighth row of scales; its first spine is minute; its length only about one-eighth the length of the second spine, which is nearly as long as the base of the fin; the third spine is a little longer than the second and fourth, and the last is two-thirds as long as the fourth. The interspace between the dorsals is as long as the last spine. The base of the soft dorsal is one third as long as the head; the longest ray is slightly longer than the base of the fin. The distance from the soft dorsal to the beginning of the caudal is about twice the greatest height of the body. The caudal is imperfect; the middle rays appear to be about two-thirds as long as the outer and a little more than one-third as long as the head. The anal originates under the seventh ray of the soft dorsal and under the twenty-ninth scale of the lateral line; the length of its base equals one third of its distance from the caudal; its first spine is very short, scarcely one third as long as the second, the length of which (7 millimeters) is one-half that of the maxilla. The longest ray is as long as the base of the soft dorsal. The vent is under the twenty-third scale of the lateral line and under the interspace between the spinous and soft dorsals. The ventral origin is behind that of the pectoral and in advance of the spinous dorsal origin; it is also under the sixth scale of the lateral line. The spine is a little more than one-half as long as the first ray. The length of the fin is one-third that of the head.

The type of the description is the only specimen obtained; it was secured by the steamer *Blake*, off Barbados, in 237 fathoms. The species is very readily distinguished from the Mediterranean species (*E. telescopus*) by its more slender form and its large number of rows of scales. The length of the specimen to the base of the caudal is 120 millimeters, the total length 137 millimeters. The caudal is somewhat imperfect.

Radial formula: D. VII, 9; A. II, 9; V. I, 5; P. 19; B. 7. Scales 4/55/8.

Colors of the alcoholic specimen: Upper parts dark brown, lower parts light brown; inside of mouth pale. At present there is an appearance of a dark band beginning on the snout and continued behind the eye along the lateral line to the tail.

POMATOMICHTHYS, Giglioli.

Pomatomichthys, GIGLIOLI, Elenco e Catalogo degli Amfibie e dei Pesci Italiani, 1880, 20.

Similar to *Apogon*, but with 4 branchiostegal rays. Scales large, deciduous. Two dorsal fins. Teeth in bands, rudimentary on the jaws, wanting on the tongue and palatines. Eyes enormous. Tail forked.

This genus is known only from a single species from the Straits of Messina.

POMATOMICHTHYS CONSTANCIÆ, GIGLIOLI.

Pomatomichthys Constanciæ, GIGLIOLI, *loc. cit.*

A *Pomatomichthys* with body whose height is contained 5 times in its length (tail included), and the depth of the head 3½. Diameter of the eye 2⅓ in the length of the head. Preoperculum with a single spine, but without serrated ridges. Dorsal with 7 spines in its first division, and 1 spine and 9 rays in the second. Anal with 2 spines and 9 rays. Pectoral fins short. Ventrals longer, extending to the vent. Lateral line entire. Scales upon caudal fin. Color brownish yellow above, silvery below and on the operculum.

The type of this species is a single specimen, 14 centimeters in length, found at the Straits of Messina, September 28, 1878, after a strong gale, which brought to the surface in immense abundance the rarest species of *Sternoptychidæ* and *Scopelidæ*.

MICROICHTHYS, Rüppell.

Microichthys, RÜPPELL, Verzeich. Mus. Senckenbergianum Aufgestell. Samml. Fische, 1852, 1.

Apogonids, said to resemble in form and position of the fins *Ambassis;* lower jaw somewhat the longer; teeth villiform, without canines, on the jaws and perhaps on palatines and tongue. An acute ridge over the eye extending backwards over the opercles. Scales large, deciduous, opercles naked. Lateral line commencing under the origin of the second dorsal fin.

This genus is represented by a small specimen, obtained in the waters near Sicily; and by another, in the Florence Museum, which we have examined, and which has the general appearance of a deep-sea fish. Its scarcity would appear to point to the same idea. This form was described by Rüppell under the name *Microichthys Coccoi.*

BREPHOSTOMA, Alcock.

Brephostoma, ALCOCK, Ann. and Mag. Nat. Hist., VI, 201, September, 1890.

A Chilodipterid with body low, rather elongate, and with delicate tissues characteristic of abyssal fishes. Head large, without keels or spines; preoperculum with a double edge. Mouth small, oblique, weak, and without teeth. Eyes large, lateral. Two separate dorsal fins, the first less developed, with 5 spines. Anal fin similar to second dorsal, with 1 spine. Ventrals thoracic, with 1 spine and 5 rays. Gill opening very wide. Scales, large, ctenoid, adherent. Branchiostegals 7. Pseudobranchiæ present. No air-bladder. Pyloric cæca long and in moderate number. (*Alcock.*)

This genus is represented by a single species, *Brephostoma Carpenteri*, obtained by the *Investigator* in the bay of Bengal, in 16° 18′ N. lat., 90° 40′ E. lon., at depths of 1,370 to 1,520 fathoms.*

Family ACROPOMIDÆ.

Acropomidæ, GILL, MS.

Percoidea, with a body somewhat elevated and a large head, forward vent, and teeth villiform in the jaws, vomer and palatines. (*Gill.*)

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* Ann. and Mag. Nat. Hist., November, 1889, 383; September, 1890, 201, Pl. IX, Fig. 4.

ACROPOMA, Temminck and Schlegel.

Acropoma, TEMMINCK and SCHLEGEL, Fauna Japonica, Poissons, 31.

Seven branchiostegals. Teeth villiform, with canines in both the jaws; teeth on the palatine bones. Two dorsals, the first with 7 (8) spines, the anal fin with 3. Operculum produced into a long denticulated point, preoperculum entire. Anus nearer the root of the ventrals than the origin of the anal. Scales moderate, deciduous, minutely ciliated.

One species of the single genus of this family, *Acropoma philippinense*, Günther, (Challenger Report, Part VI, 51; XXII, 15) was found near the Philippine Islands by the *Challenger* at a depth of 82 to 102 fathoms.

Family SCOMBROPIDÆ.

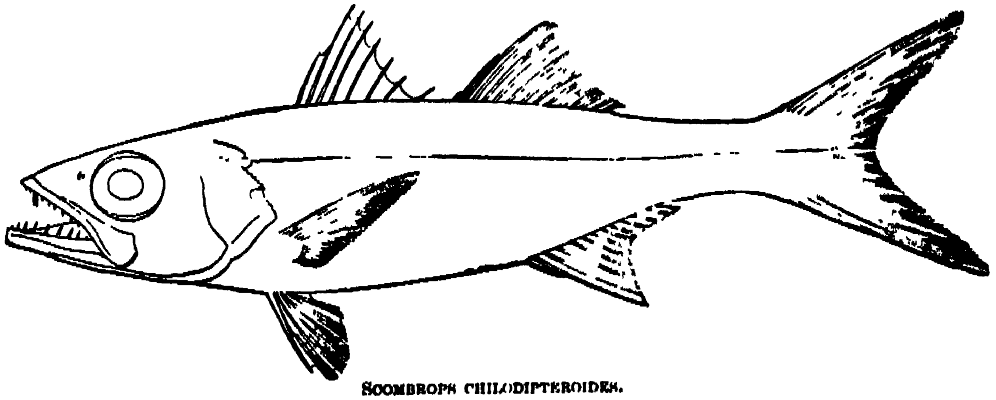
Scombropidæ, GILL, MS.

Percoidea, with teeth on jaws, vomer and palatines, and long, strong canines in both jaws, sometimes barbed. Bones of skull without denticulations. Operculum with 2 weak spines. Scales rather small, very thin, smooth. (*Gill.*)

SCOMBROPS, Temminck and Schlegel.

Scombrops, TEMMINCK and SCHLEGEL, Fauna Japonica, 118.—GÜNTHER, Cat. Fish. Brit. Mus., I, 249.
Latebrus, POEY, Mem. Hist. Nat. Cuba, II, 1858, 158.

Scombropids having 2 long canine teeth in the upper jaw and a series of similar teeth in the lower. First dorsal with 8 spines; anal with 3 spines. Bones of the skull without denticulations. Spines feeble. Lower jaw longest.



SCOMBROPS CHILODIPTEROIDES.

This genus is represented in the Japanese Sea by a single species, *S.* obtained by the Dutch naturalists and by the *Challenger* off Inosima, Japan, at a depth of 345 fathoms. The *Challenger* specimen was 16 inches long.

SCOMBROPS OCULATUS, POEY.

Latebrus oculatus, POEY, Mem. Hist. Nat. Cuba, II, 1858, 168, Pl. XIII, Figs. 11, 12 (jaws with teeth); Pl. XIV, fig. 2 (outline).—GÜNTHER, Challenger Report, XXII, 1887, 14.

Body elongate, its height contained 4⅝ times in its total length; the head 3½. The eye is very large, its diameter contained 3½ times in the length of the head. The nostrils have vertical apertures, and are near the orbit. The length of the maxillary is four-fifths that of the diameter of the eye. The suprascapulary bone projects. The premaxillary bears about 12 canine teeth; there are 2 to 4 teeth longer than the others on its anterior portion on the inner edge. The teeth of the mandible are a little longer than those on the maxillary.

The first dorsal originates in the vertical from the lower base of the pectoral, and the second over the vent but a little in advance of it. The second dorsal and the anal are similar in form and height; they are triangular, with sharp angle, and emarginate. The caudal is forked. The first spine of the dorsal is feeble, although nearly as high as the second, which is the longest. The spinous rays of the second dorsal and the anal, and those in the ventral, have their points covered. The scales are large, deciduous, from 45 to 50 between the shoulder and the tail; they are thin, with smooth edges; they cover the entire body except the lips. The vertical fins are also scaly, except the first dorsal.

Radial formula: D. VII, I, 14; A. III, 12; P. 16; V. I, 5; C. 17.

Color brownish violet, lighter upon the belly.

This fish, according to Poey, is rare and inhabits great depths. In the month of October he has seen individuals weighing 14 pounds.

Dr. Günther remarks that, but for the barbed teeth, he would be disposed to unite this species with *Scombrops chilodipteroides*, but we should hesitate to follow his lead, since the scales in the latter are considerably smaller, the body apparently more slender, the fins longer and stronger, and the two dorsals more closely approximated, while the lower jaw would appear to be longer, and the second dorsal planted (relatively to the vent) much farther forward.

HYPOCLYDONIA, Goode and Bean, n. g.

This genus resembles *Scombrops* in form and is closely related to it, but (1) none of the vertical fins are scaly; (2) the tongue is toothless; (3) the soft dorsal and anal have few rays.

The body is covered with thin, deciduous, cycloid scales. The entire head is scaly with the exception of the angle of the preoperculum, but the scales of the head are deeply imbedded in the skin and are covered by minute pores, so that their outlines are almost entirely concealed. Eye large. Mouth moderately large; the upper jaw slightly protractile. Teeth in the intermaxilla minute in broad bands which are separated at the symphysis by a narrow, naked interspace. A pair of strong canines near the symphysis of the intermaxillaries. The mandible has a marked concavity in front on each side of the symphysis, this concavity being armed with a band of minute teeth. Four small canine-like teeth in an irregular group at the symphysis; 5 additional canines on the mandible, increasing in size backward and continued behind by a short, narrow band of minute teeth. Minute teeth on the vomer in a triangular patch. Palatine teeth in bands, which are broadest in front. Anterior nostril small, circular, not tubular. Posterior nostril in a long wedge-shaped slit. Maxilla dilated posteriorly. The lower lip well developed, broadly attached to the under surface of the maxilla. Preoperculum minutely serrated behind and below; operculum with two thin, flat spines.

Branchiostegals 7; gill-rakers in moderate number, rather stout; gill laminæ well developed; a moderate-sized slit behind the fourth gill; pseudobranchiæ well developed; a glandular organ in the upper angle of the gill opening; fins well developed, the spinous dorsal longer than the second dorsal; dorsal with 9, anal with 2 spines; ventrals long; scales large, thin, cycloid, deciduous; lateral line high up with a gradual curve nearly following the outline of the back.

HYPOCLYDONIA BELLA, GOODE and BEAN, n. s. (Figure 237.)

The largest specimen taken by the *Albatross* is 90 millimeters long. The greatest height of the body is contained three and two third times in the total without caudal. The least height of the tail equals the length of the eye. The length of the head is one-third of the total without caudal. The eye is two-sevenths as long as the head and a little greater than the width of the interorbital space. The snout is two-thirds as long as the eye. The maxilla reaches nearly to below the middle of the eye; its length is two-fifths the length of the head. The upper jaw is contained two and one-third times in the length of the head. The length of the mandible is one-half the length of the head. The spinous dorsal begins over the origin of the pectoral. The first spine is very short, less than one-third as long as the second and not much longer than the last; the third and longest spine is as long as the postorbital part of the head. The interspace between the two dorsals is very short. The longest ray of the soft dorsal is two-thirds the length of the mandible. The anal originates under the middle of the soft dorsal; the length of its base equals the length of the eye. The first spine is less than one-half as long as the second, which is about two-thirds as long as the eye. The anal spines are slender. The longest anal ray equals the postorbital part of the head. The pectoral reaches to below the origin of the soft dorsal; its length equals that of the head without the snout. The ventral begins slightly in advance of the origin of the pectoral and it is nearly as long as the pectoral, its length one-quarter of the total without caudal.

Radial formula: D. IX, I, 9; A. IV, 7; V. I, 5; P. I, 15. Scales 2/29/7.

The colors have faded; traces of purplish brown on the upper parts and the head; spinous dorsal with a dark triangular blotch on its upper portion extending from the second to the sixth spine, involving less than half the height of the membrane.

Specimens were obtained by the *Albatross* from station 2314, in 32° 43′ N. lat., 77° 51′ W. lon. (off South Carolina), at a depth of 159 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon. (between the Delta of the Mississippi and Cedar Keys, Florida), at a depth of 280 fathoms; from station 2401, in 28° 38′ 30″ N. lat., 85° 52′ 30″ W. lon. (between the Delta of the Mississippi and Cedar Keys, Florida), at a depth of 142 fathoms; from station 2417, in 33° 18′ 30″ N. lat., 77° 07′ W. lon. (off Cape Fear), at a depth of 95 fathoms; from station 2418, in 33° 20′ N. lat., 77° 05′ W. lon., at a depth of 90 fathoms; from station 2425, in 36° 20′ 24″ N. lat., 74° 46′ 30″ W. lon., at a depth of 119 fathoms; and from station 2426, in 36° 01′ 30″ N. lat., 74° 47′ 30″ W. lon. (off North Carolina), in 93 fathoms.

Family SERRANIDÆ.

Serranidæ, RICHARDSON, Ichth. Erebus and Terror, 1848, IV (in part).—GILL, Arr. Fam. Fishes, 1872 (in part.); Century Dictionary, 5573.—JORDAN & GILBERT, Bull. XVI, U. S. Nat. Mus., 526.—JORDAN and EIGENMANN, Bull. U. S. F. C., VIII, 1888, 329, 433.

Serranina, GÜNTHER, Cat. Fish. Brit. Mus., I, 57, 81–212.

Percoidea with the body oblong, compressed, and covered with scales; the head compressed, and the cranium normal. The premaxillaries not retractile behind, under the suborbitals. The spinous part of the dorsal fin about as long as the soft, or longer, and with 3 anal spines developed. (*Gill.*)

CENTROPRISTIS, Cuvier.

Centropristes, CUVIER, Règne Animal, ed. 2, 1829.

Centropristis, CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, 56.—JORDAN and EIGENMANN, Bull. U. S. Fish Com., VIII, 1888 (1890), 390.

Triloburus, GILL, Cat. Fish. East Coast U. S., 1861, 30.

Serranoid fishes, with comparatively elongate body. No supplemental bone to the maxillary. Teeth small, in broad bands. Top of head naked, supraoccipital crest prominent, encroaching somewhat on the frontal region. No hooked spinules on the lower limb of the preoperculum. Scales large. Dorsal spines slender, the third a little elevated; some of them with dermal appendages or filaments. Caudal fin not lunate, ending in 3 bands, the middle rays extending beyond the outer ones.

Two species of this genus have been found in deep water—one, *Centropristis pleurospilus* Günther*, from the sea between Australia and New Guinea, near the Ki Islands, at a depth of 140 fathoms; and *Centropristis investigatoris*, Alcock,† from off the Madras coast, in 100 fathoms.

ANTHIAS, Schneider.

Anthias, BLOCH, Syst. Ichth., 1792.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., II, 249.—GÜNTHER, Cat. Fish. Brit. Mus., I, 88.—JORDAN, Cat. Fish. N. Amer., 83.

Aylopon, RAFINESQUE, Caratteri, etc., 1810, 52.

Serranoids with strongly compressed body, closely resembling *Serranus*, but having the lateral line placed very high and concurrent with the back, becoming abruptly straight and horizontal below last rays of dorsal. Snout blunt; mouth oblique; maxillary broad and scaly. Fins with a tendency to filamentous production of the rays. Caudal forked. (*Jordan.*)

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* Challenger Report, I (Part VI), 37, pl. XVI, fig. D.

† Ann. and Mag. Nat. Hist. (VI), September, 1890, 199.

This genus has been found in deep water in the Pacific. *Anthias megalepis*, Günther,* was taken off the Ki Islands, at 140 fathoms, in company with the *Centropristis* already referred to, and *Anthias eos*, Gilbert,† taken in the Gulf of California at 112 fathoms.

A specimen (Cat. No. 37346, U. S. N. M.) obtained by the *Fish Hawk*, has been misplaced, and cannot now be fully described. The name *Anthias aquilonaris* has been proposed by us for it. It is allied to *Anthias oculatus*, C. & V.

A note indicates that the length of its head was equal to the height of its body, which is contained 2⅜ times in the total length (without caudal). The diameter of the orbit is contained 3⅛ times in the head. The maxillary bone was naked, rather than scaled as in *A. oculatus;* and the scales numbered 53 in the lateral line, 7 above and 14 below. The radial formula was D. X, 11; A. III, 8.

A small specimen, possibly of the same species, was obtained by the *Blake*, off Dominica, at station CVI, in 524 fathoms; but since this is less than 2 inches long and the subject of the above note was 9, it is impossible to confirm the identification in the absence of the larger specimen.

POLYPRION, Cuvier.

Polyprion, CUVIER, Règne Animal, 2nd ed., 1829, II, 145.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., II, 21.—GÜNTHER, Cat. Fish. Brit. Mus., I, 168.—JORDAN and GILBERT. Bull. XVI, U. S. Nat. Mus., 532.—GILL, Century Dictionary, 4609.

Hectoria, CASTELNAU, Proc. Zoöl. Soc., Victoria, II, 1873, 151.

Serranoids having body oval, compressed, covered with small, ctenoid scales; head large, rough, with numerous crests and furrows; operculum spiniferous, with spine-tipped crest; preoperculum, suboperculum, and interoperculum denticulated. Snout short; mouth large, oblique; teeth in villous bands upon the jaws, vomer, palatines and tongue. Branchiostegals 7. Dorsal fin long, with 11 spines and 11 or 12 soft rays, the spines serrated. Anal with strong spines. Tail rounded.

POLYPRION AMERICANUM, (SCHNEIDER), JORDAN. (Figure 238.)

Le Merou de Cap Breton, DUHAMEL DU MONCEAU, Traité des Pesches, 1769, p. 38.

Amphiprion americanum, SCHNEIDER, Bloch's Syst. Ichth., 205, pl. XLVII.

Polyprion americanum, JORDAN, Cat. Fish. N. Amer., 1885 (1889), 83.

Epinephelus oxygeneios, SCHNEIDER, *op. cit*, 301.

Polyprion oxygenius, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1883, 532.

Scorpæna massiliensis, RISSO, Ichthyologie de Nice, 1810, 184.

Holocentrus gulo, RISSO, Hist. Nat. Eur. Mérid., 1826, III, 367.

Polyprion cernium, VALENCIENNES, Mém. du Muséum, XI, 265, pl. XVII.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 21, pl. XLII, VIII, 475.—YARRELL, Brit. Fish, 2d ed., I, 19, fig. (ed. 3) II, 124.—SWAINSON, Fishes, II, 203.

Perca prognathus, FORSTER, MS.

Polyprion prognathus, GÜNTHER, Ann. & Mag., Nat. Hist., 1887, 236.

Serranids with body robust, elevated, its height two-fifths of its length and somewhat compressed. Mouth large, the maxillary extending to vertical from posterior margin of orbit; lower jaw longer. Supraocular region, scapula, suprascapula, preopercle, and a ridge on opercle spinigerous. Anal spines short, serrate anteriorly, the third much the longest. Caudal rounded.

Radial formula: D. XI, 12; A. III, 8.

Color, brownish gray, the caudal with a white margin.

This fish, the *Cernier*, *Cerniola*, or Stone Bass of Europe, is found along the coasts of

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*Challenger Report, I, (Part VI), 37, pl. XVI, fig. G.

†*Pronotogrammus eos*, Gilbert, Proc. U. S. Nat. Mus., XIII, 62.

Europe from Norway to the Mediterranean and the Cape of Good Hope, and has also been recorded from Madeira and the Southern Indian Ocean.

A specimen was obtained on the Grand Banks by one of the Gloucester fishing vessels.

Family LUTJANIDÆ.

Lutjanidæ, GILL, Proc. U. S. Nat. Mus., 1884, 351.

Acanthopterygians of the ordinary type with compressed head and body, the supramaxillary bones slipping under the preorbital, continuous lateral line, dorsal with spinous part depressible in a groove. Pectorals with lower rays branched. Teeth all conical and pointed, and canines more or less developed in jaws. Vomer dentigerous. Preopercle serrate. Dorsal fin continuous. Pyloric cæca few.

APRION, Cuvier and Valenciennes.

Aprion, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VI, 18, XX, 544, pl. CLXVIII.—GÜNTHER, Cat. Fish. Brit. Mus., I, 81.—GILL, Proc. U. S. Nat. Mus., 1884, 351.

Lutjanoids characterized by the presence of villiform teeth on the vomer, acute teeth in the jaws; interobital area flat, separated by a line from the occipital region. Dorsal fin continuous. Supraorbital margin crenate; periotic region much swollen outwards, and with the bones thin and polished; preorbital moderate; frontals behind, with funnel-shaped foramina; soft dorsal and anal scaleless; last rays of dorsal and anal produced. (*Jordan.*)

APRION MACROPHTHALMUS, (MÜLLER) JORDAN and SWAIN. (Figure 314.)

Centropristis macrophthalmus, MÜLLER and TROSCHEL, in Schomburgh's Hist. Barbadoes, 666, 1848 (young).
Elastoma macrophthalmus, COPE, Trans. Am. Philos. Soc., 468, 1869 (St. Martin's, New Providence, St. Croix).
Mesoprion vorax, POEY, Mem., II, 151, 1860 (Cuba).
Platyinius vorax, GILL, Proc. Acad. Nat. Sci. Phila., 1862 (generic diagnosis).—POEY, Synopsis Pisc. Cub., 1868, 292; Enumeratio, Pisc. Cub., 1875, 31.
Aprion macrophthalmus, JORDAN and SWAIN, Proc. U. S. Nat. Mus., VII, 1884, 467.

An *Aprion* having the body oblong-elliptical, its height contained 3 times in length. Mouth rather small, the canines feeble; tongue toothless; vomerine teeth in a Λ-shaped patch. Scales large, regularly arranged, those above lateral line in series parallel with the lateral line, which contains from 53 to 60 scales, with 7 above, 14 or 15 below, and 52 pores. Dorsal spines 10; last ray of dorsal and anal produced. Gill-rakers numerous, about 17 on lower part of arch. Color rose-red, with some pearly markings.

Radial formula: D. X, 11; A. III, 8.

This species, described from moderate depths off Barbadoes, St. Martin's, New Providence, St. Croix, and Cuba, was taken by the *Blake* at station CCLXI, in 23° 15′ N. lat., 89° 10′ W. lon., at a depth of 84 fathoms.

VERILUS, Poey.

Verilus, POEY, Mem. Hist. Nat. Cuba, II, 1860, 125.—GILL, Proc. U. S. Nat. Mus., 1889, 355.—JORDAN and SWAIN, Proc. U. S. Nat. Mus., VII, 429, 470.

A genus of Lutjanoids characterized by cavernous frontals (like those of Sciænoids), with longitudinal osseous bars, leaving interspaces in front of transverse ridge and on each side near the front; supraorbital margins smooth; prefrontals behind with simple foramina for olfactory nerves; body comparatively short and deep; head scaly above and on jaws and snout; soft dorsal and anal scaly at base; peritoneum and lining of gill cavity black; caudal lunate.*

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* This, as Jordan and Swain have pointed out, is evidently from its structure a true bathybial form.

VERILUS SORDIDUS, Poey. (Figure 232.)

Verilus sordidus, POEY, Mem. Hist. Nat. Cuba, II, 125, 1860, tab. 12, fig. 6 (Cuba); Repertorio, II, 157, 1867; Synopsis, 291, 1868; Enumeratio, 1875, 32.—JORDAN and SWAIN, Proc. U. S. Nat. Mus., VII, 471.

Body oblong, compressed, rather robust; caudal peduncle short and thick; head large, profile almost straight from snout to origin of spinous dorsal, and not at all steep. Snout very short and blunt, 4 in head. Eye very large, 2⅞ in head. Interorbital space flat, its width 4⅗ in head. Occipital keel very low. Preorbital very narrow, 7 in eye, nearly 20 in head. Maxillary reaching middle of eye, 2 in head. Mouth large, oblique, the lower jaw projecting. Upper jaw with a rather broad band of villiform teeth, the outer row scarcely enlarged; two moderate canines in front of jaw, curved inward. Lower jaw with a single series of teeth on the sides, this series giving place to a very narrow villiform band in front, with two (sometimes duplicated) small canines directed nearly horizontally backward. Vomer with a narrowly Λ-shaped patch of teeth, without backward prolongation on median line. Tongue and pterygoids without teeth. Gill-rakers numerous, their length almost half diameter of eye; 17 on the lower part of the arch well developed. Preopercle with posterior margin weak and flexible, almost entire, becoming somewhat serrate at the angle and on lower limb; no distinct emargination, but the angle salient, membranaceous. Scales large, the rows horizontal below the lateral line; those above rather irregular, the series running upward and backward. Head scaly everywhere, the scales generally smaller than on body; opercle with three rows of scales, very large, with one row on subopercle; cheeks with many rows of scales, those in the middle very small; one or two rows on interopercle. Base of soft dorsal and anal somewhat scaly. Branchiostegals 7. Spinous and soft dorsals entirely separate; first spine 4½ in second, which is 2⅙ in head, the spines thence becoming gradually shorter to ninth spine, which about equals length of first spine. Last rays of dorsal and anal not produced; margin of soft dorsal slightly concave, the anterior rays longest, 2⅓ in head; anal similar to soft dorsal, its margin rather more concave; first soft rays extending beyond tips of last rays, when the fin is depressed. Anal spines moderate, the third slightly longer than second, 2⅔ in head; caudal fin short, broad, moderately forked, the upper lobe longer, its length scarcely twice that of middle rays, which are 2⅝ in head. Pectorals long, reaching to origin of anal, 1⅕ in head; ventrals 1⅔ in head.

Color in spirits dusky gray, slightly paler below; tips of spinous dorsal and ventrals jet black, the fins otherwise colored as the body; posterior edge of caudal dusky; lining of gill cavity, peritoneum, and posterior part of mouth jet black.

Radial formula: D. IX, I, 10; A. III, 7; Scales: 4–43–9; 41 pores.

"L'espèce est rare," writes Poey, "on la peche à de grandes profondeurs. On en prend de cinq livres."

DENTEX, Cuvier.

Dentex, CUVIER, Règne Animal, ed. I, 1817, II, 272; ed. II, 1829, II, 184.

Lutjanids with the body oblong, compressed, covered with ctenoid scales of moderate size. Head large; teeth all sharp, in villiform bands, with canines to the number of 3 or 4 in each jaw. Preorbitals entire, broad. Preoperculum entire, with more than 3 rows of scales; operculum not conspicuously armed. Gill openings broad. Branchiostegals 6; pseudobranchiæ present. Dorsal with 10 to 12 spines and 9 to 10 soft rays; anal with 3 spines and 8 to 9 rays; the two vertical fins received in a furrow. Caudal more or less forked.

This genus, which is found in the temperate and tropical Atlantic, the Mediterranean, the Red Sea, the Sunda Sea, and the Sea of Japan, is represented in deep water by one species, identified by Vaillant with *S. macrophthalmus*.

DENTEX MACROPHTHALMUS, (BLOCH) CUVIER and VALENCIENNES.

Sparus macrophthalmus, BLOCH, Ichthyol., pl. 272.—RISSO, Ichth. Nice, 1810, 250.
Cichla macrophthalma, SCHNEIDER, Bloch, Syst. Ichth., 1801, 337.

Dentex macrophthalmus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VI, 227.—GUICHENOT, Explor. Sci. Algèr. Poiss., 51.—VALENCIENNES, in Webb & Berthelot, 37.—BONAPARTE, Catalogo, 455.—GÜNTHER, Cat. Fish. Brit. Mus., I, 370.—CAPELLO, Cat. Peix. Portugal, 17.—CANESTRINI, Fauna Italica, 83.—MOREAU, Hist. Nat. Poiss. France, III, 59.—VAILLANT, Exped. Sci. Travailleur et Talisman, 358.

A *Dentex*, with the height of its body a little less than length of head, and included 3½ times in the total length. Eye large, its diameter contained three times in the length of the head, and greater than the distance between the eyes. Second anal spine longer and thicker than the third. Scales about 58 to 60 in the lateral line; 6 above and 13 below.

Radial formula: D. XII, 9–10; A. III, 7–8.

Color, uniform red.

The French explorers obtained in all 11 specimens of this species in considerable depths of water; 6 from the Banc d'Arguin, 140–235 meters; 4 off the coast of Soudan, 130–410 meters, and 1 off the coast of Morocco in 120 meters. The identification of these specimens with the Mediterranean form is accepted on the authority of Vaillant, although the material for the study of *D. macrophthalmus* is not very ample.

Family PRIACANTHIDÆ.

Priacanthina, GÜNTHER, Cat. Fish. Brit. Mus., I, 1859, 215, 221.

Priacanthidæ, GILL, Arr. Families Fishes, 1872, II (No. 112.)—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 544.

Body oblong or ovate, compressed, covered with scales. Mouth large, oblique, lower jaw prominent. Teeth villiform on jaws, vomer, and palatines. Eye very large. Preopercles less serrated, with one or more spines at angle; opercula short, with two or three points behind. Scales firm and rough, covering all parts of the body and head. Gill membranes separate, free from the isthmus. Pseudobranchiæ large. Gills 4, a slit behind the fourth. Gill-rakers long. Branchiostegals 6. Lateral line continuous. First dorsal composed of about 10 spines, depressible in groove; anal with 3 spines; soft part long, similar to soft dorsal; ventrals thoracic, I, 5; pectorals small, rounded; caudal fin truncate or lunate.

KEY TO THE GENERA.

A. Scales small. Body rather elongate, its depth less than half its length .... PRIACANTHUS

B. Scales large. Body rather short, its depth more than half its length .... PSEUDOPRIACANTHUS

PRIACANTHUS, Cuvier and Valenciennes.

Priacanthus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 96.—GÜNTHER, Cat. Fish. Brit. Mus., I, 215.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 544.

Priacanthids with body somewhat elongate, compressed, the height being less than half the length. Scales small. Other characters included in the family diagnosis.

PRIACANTHUS CATALUFA, POEY.

Priacanthus macropththalmus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 95 (not *Anthias macrophthalmus*, BLOCH).—GÜNTHER, Cat. Fish. Brit. Mus., I, 215.—JORDAN and GILBERT, Bull. XVI, U. S Nat. Mus.

Priacanthus catalufa, POEY, Proc. Acad. Nat. Sci. Phila., 1863, 182 (Parras "*Catalufa*").

Priacanthus arenatus, JORDAN and GILBERT, *op. cit.*, 971 (not *P. arenatus*, CUV. and VAL.).

Body oblong, compressed, and little elevated. Its height three eighths its length. Head short, its length contained 3¼ times in that of body. Gape of mouth subvertical, maxillary passing front of eye. Diameter of orbit about one-half length of head and more than 6 times width of preorbital. Ventrals long, reaching front of anal; pectorals small, not longer than eye. Lateral line with 85 scales, following the curve of the back.

Radial formula: D. X, 14; A. III, 15.

Color, uniform red, fins edged with dusky.

A specimen was obtained by the *Blake* at station CCXXXV, off Havana, in 243 fathoms. This species is a member of the West Indian fauna. It is possible that it was taken nearer the surface than the records would indicate.

PSEUDOPRIACANTHUS, Bleeker.

Pseudopriacanthus, BLEEKER.—JORDAN, Cat. Fish. N. Amer., 1887, 86.

Priacanthids, having the body rather short, compressed, its height more than half its length. Scales comparatively large and rough. Posterior nasal aperture a curved slit. Angle of preoperculum with strong spine. Dorsal and anal spines striated. Anal rays 10–11; dorsal rays 12–13. Other characters included in the family diagnosis.

PSEUDOPRIACANTHUS ALTUS, GILL. (Figures 239, 240.)

Priacanthus altus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 132.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 545.
Pseudopriacanthus altus, JORDAN, Cat. Fish. North America, 1887, 86.

Body oblong, its length exceeding its height by one-half, compressed and elevated. Head high and short, its length two-fifths that of body. Profile very oblique; snout extremely short; gape of mouth very oblique, maxillary reaching to below orbit. Diameter of orbit about one-half length of head. Spines stout. Scales rough and large, 45 in lateral line, which runs obliquely upward in front, then abruptly turns downward. Ventrals large, surpassing origin of anal. Preopercles and opercles coarsely serrate at angle and below; angle of preopercle with two spines. Caudal fin rounded.

Radial formula: D. x, 11; A. III, 9.

Color, tawny red, the vertical fins dotted with black, and the ventrals black.

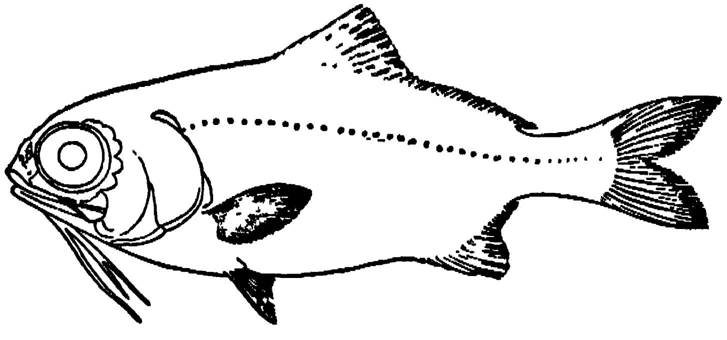
The type was obtained in Narragansett Bay, September, 1860, evidently an estray from southern waters.

A large specimen, 5 inches long, was obtained by the *Albatross* at station 2316, N. lat. 24° 25′ W., lon. 81° 46′ 45″ in 45 fathoms, and two smaller ones at station 2606, in 25 fathoms. (Both of these are illustrated. Fig. 236 is 8 times natural size; Fig. 236 A, 4 times.) The species is not known to be abyssal, and has no claim to a place in this list, except that it has been accidentally included in similar lists before, and should be accounted for.

Family POLYMIXIIDÆ.

Polymixiidæ, GILL, Arr. Fam. Fish. 1872, name only (No. 99); Johnson's Cyclopædia, 1323.

A family of teleocephalous fishes distinguished by the peculiar union of characters. The body is rather elongated and compressed; the scales are not serrated; the lateral line is continuous with the back; head compressed and with a decurved profile; preoperculum serrated; mouth with a lateral and nearly horizontal cleft; teeth villiform, on the jaws as well as palate; branchiostegal apertures large; branchiostegal rays 4; dorsal moderately elongated, with several spines, increasing backward; anal opposite the posterior portion of the dorsal, armed with 3 or 4 spines; pectorals with branched rays; ventral fins thoracic, each with a spine and 6 or 7 rays. The skeleton has the vertebræ in increased number (29). The family is distinguished by the combination of chin barbels, increased number of rays, and small number of branchiostegals. Its affinities are doubtful, but on the whole seem to be rather with the *Mullidæ*. (*Gill.*)



POLYMIXIA NOBILIS.

POLYMIXIA, Lowe.

Polymixia, LOWE, Trans. Cambridge Phil. Soc., 1838, VI, 198.—GÜNTHER, Cat. Fish. Brit. Mus., I, 16.
Nemobrama, VALENCIENNES, in Webb and Berthelot, Ichth. Iles Canar. Poiss., 40.
Dinemus, POEY, Mem. Hist. Nat., Cuba, II, 161, 1860.

Snout short, with the cleft of the mouth nearly horizontal. Eye large. Two barbels at the throat. Opercles without armature. Scales of moderate size. One dorsal. Anal with 3 or 4 spines. Caudal forked. Ventrals with 6 or 7 short rays. (*Günther.*)

The fishes of this genus have, according to Günther, about the same bathymetrical and horizontal distribution as *Beryx*.

POLYMIXIA NOBILIS, LOWE. (Figure 241.)

Polymixia nobilis, LOWE, Cambr. Phil. Trans., 1838, VI, 198. (Specimens from Madeira).—GÜNTHER, Cat. Fish. Brit. Mus., I, 17; Challenger Report, XXII, 1887, 34, pl. I, fig. 31.—ALCOCK, Ann. and Mag. Nat. Hist., 1889 (Nov.), 381.

Nemobrama Webbii, VALENCIENNES, in Webb & Berthelot, Ichthyol. Iles Canaries, 11, pl. VIII (specimens from the Canaries).

Polymixia Lowei, GÜNTHER, *op. cit.*, I, 17.—POEY, Repert. Fis. Nat. Cuba, II, 159.

Dinemus venustus, POEY, Mem. Hist. Nat. Cuba, II, 1860, 161, 352, pl. XIV, fig. 1 (*Barbudo* in Cuba).—Zoological Record, 1868, 147.

Polymixia japonica, GÜNTHER, Ann. and Mag. Nat. Hist., 1877, XX, 436 (specimens from Inosima, Japan).—STEINDACHNER, Denkschr. Akad. Wiss. Wien, 1883, XLVII, 261, tab. IV, fig. 2.

A *Polymixia*, with compressed, elevated body, whose height is contained 3⅔ times in its total length, and is nearly equal to the length of head. Head with blunt snout and slightly projecting upper jaw. Mouth wide, the maxillary ending beyond vertical from posterior margin of orbit, and terminating posteriorly in a broad plate. Teeth in broad, velvet-like bands, present on jaws, palatines, pterygoids, vomerines, tongue, and branchial arches. Eye placed high, but below upper profile of head; its diameter contained about 3 times in the head's length. Opercles spineless. Scales oblique, irregular, completely covering body and head; 48–54 in lateral line.

Radial formula: D. V, 28–38; A. III–IV, 16–18; V. I, 6–7.

Color a soft violet, brownish, opalescent on the back and fins. Upper margin of orbit, and two bands above the snout, golden green; maxillary roseate, inner margin of caudal lobes whitish. Iris white, opalescent.

This species has been exhaustively studied by Dr. Gunther, who has access to specimens from various parts of the tropical and subtropical Atlantic, namely, near Madeira, the Canary Islands, St. Helena, and Cuba. The *Challenger* expedition brought home specimens from the Sea of Japan, where they were captured off Inosima at a depth of 345 fathoms. The *Investigator* took it in the Andaman seas, in 271 fathoms. The species has been found by Poey at Cuba. The British Museum in 1886 received a specimen from Mauritius, the first of its kind which the fishermen remembered to have seen. The wide geographical range of this form is remarkable, although it is possible that it does not descend to very great depths or extend beyond the tropical or subtropical zones. From comparison of all the materials in his possession, Dr. Günther has become convinced that the differences on which he formerly based his conclusion that there were three species, were really not sufficiently marked to justify his conclusions.

Family POMACENTRIDÆ.

Pomacentridæ, BONAPARTE, Catalogo Metodico, Pesci Europei, 1846, 81.—GÜNTHER, Cat. Fish., Brit. Mus., IV, 1862, 2.—GILL, Arr. Fam. Fishes, 1872, 7. No. 64.

Pomacentroidei, BLEEKER, Tentamen, 1859, XVIII.

Pharyngognaths with ctenoid scales, pseudobranchiæ and gills 3½. Teeth feeble; palate edentulous. Lateral line incomplete or interrupted. Dorsal in two nearly equal portions, the first spinous. Anal similar to soft portion of dorsal. Ventrals thoracic, I, 5. Branchiostegals, V–VII. Pseudobranchiæ present. Air bladder present.

The Pomacentrids live in warm waters, especially among coral reefs and usually near rivers and in very shallow water. Only one species has been found at considerable depths, and it is probable that its occurrence out of the shallows was not positively determined.

CHROMIS, Cuvier.

Chromis, CUVIER, Règne Animal, ed. 1, II, 1877, 266.
Heliases, CUVIER and VALENCIENNES, Hist. Nat. Poiss. V, 493. Mem. Mus. Nat. Hist. Nat., I, 1815, 353.
Heliastes, GÜNTHER, Cat. Fish Brit. Mus., IV, 60.

Preoperculum not denticulated. Teeth small, conical, in a narrow band or irregular series. Dorsal fin with 12 to 14 spines, anal with 2. Scales of moderate size; the lateral line ceases below the posterior portion of the dorsal fin. Branchiostegals 5; gills 3½; pseudobranchiæ present; pyloric appendages 2.

A single representative of this well-known tropical genus, has been found under such circumstances as to lead to the belief that it could live in deep water. This is *C. roseus*, the *Heliastes roseus* of Günther. Challenger Report, VI, 1880, 45, pl. XX, 1887, page 76. It was taken at *Challenger* station 192, off the Ki Islands, in 140 fathoms.

Family SCORPÆNIDÆ.

Les Scorpenides, RISSO, Hist. Nat. Europe Méridionale, 1826, III, 109, 367.
Scorpænidæ, SWAINSON, Nat. Hist. Fish, etc., II, 1839, 180.—GILL, Arr. Fam. Fishes, 1872, 6 (No. 58).—GÜNTHER, Zoological Record, VII, 1870, 91; Challenger Report, XXII, 16.—GILL, Johnson's Cyclopædia, IV, 143.—JORDAN and GILBERT, Bul. XVI, U S. Nat. Mus., 650.
Scorpænina, GÜNTHER, Cat. Fish. Brit. Mus., II, 1860, 87, 95.
Cataphracti (part), CUVIER, Regne Animal, both editions.—MÜLLER, Berlin, Abhandl., 1844, 201.
Sclerogenidæ (part), OWEN, Lectures, Comparative Anatomy of the Vertebrates, I, 49.
Triglidæ (part), KAUP, Wiegmann's Archiv., 1858, 329.
Scorpænoidei, BLEEKER, Tentamen, 1859, XXI.
Scorpænini, BONAPARTE, Catalogo Metodico, 1846, 61.

Scorpænoid[1] fishes with body oblong, more or less compressed, head moderately large, often inflated laterally, usually with one or more pairs of spine-tipped ridges above, opercle usually with two, preopercle with five, spinous processes. Mouth wide, terminal, with villiform teeth on jaws, vomer and palatines. Premaxillaries protractile. A bony stay, extending from the suborbital to the preopercle. Branchial apertures extending forward, wide, separate, and free from isthmus. Scales ctenoid, or rarely cycloid, sometimes nearly obsolete. Lateral line single, continuous, concurrent with the back. Dorsal fin with 8 to 16 rather strong spines, and a similar number of rays, set closer than the spines so that the soft portion of the fin is the shorter, the fin being sometimes continuous and sometimes notched so deeply as to divide it into two parts. Anal rather short, with 3 spines and 5 to 10 rays. Ventrals thoracic or post thoracic, with 1 spine and 4 to 9 rays. Soft fin rays all branched except lower rays of pectoral. Air bladder present. Pseudobranchiæ large. Pyloric cæca few (less than 12).

KEY TO ATLANTIC DEEP-SEA GENERA OF SCORPAENIDÆ.

1. Dorsal continuous, though somewhat notched.
    A. Dorsal spines XII; anal III, 5; vertebræ 10+14.
        1. Head naked above, with several series of spinous ridges. Scales cycloid. Cheeks smooth.
            a. A square occipital pit. Cheeks and opercles scaleless. Scales on body small. Laciniæ present. Pectorals broad, rounded, procurrent...SCORPÆNA
            b. "Wide, muciferous cavities in superficial bones of skull. Scales on lateral parts of head hidden in skin. Cleft of mouth very wide." Sea of Japan ....[BATHYSEBASTES]
        2. Head scaly above. Scales ctenoid, on cheeks and opercles, as well as on body.
            a. No occipital pit. Pectorals not procurrent.
                Pectoral rays in three groups, the medial ones of branched rays. Suborbital keel smooth, or with a single anterior spine ....HELICOLENUS
                Pectoral rays all simple. Two retrorse spines on each preorbital. Suborbital keel with three strong spines ....PONTINUS

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[1] Gill's superfamily *Scorpænoidea* (including *Scorpænidæ*, *Synanceidæ*, *Hexagrammidæ*, and *Anoplopomidæ*) is composed of mail-cheeked fishes 'having the hypercoracoid and hypocoracoid bones normally developed, a complete myodome, and post-temporals normally articulated with the cranium."

B. Dorsal XIII, 6–9; anal III, 6–9; vertebræ 12+15.
1. Cranial ridges more or less developed. Head more or less scaly.
a. Palatine teeth present.
Scales small (90–100 in lateral line). Lower jaw much projecting. Cranial ridges low. Anal III, 9 .... [SEBASTODES]
Scales moderate (45–80.) Anal III, 5–9 .... [SEBASTICHTHYS]
C. Dorsal spines XV .... SEBASTOMUS and SEBASTOSOMUS
1. Anal III, 7–8; vertebræ 12+19. Head scaly above, with one or two pairs of spine-tipped ridges.
a. Pectorals long, narrow. Ventrals post-thoracic. Scales ctenoid. No laciniæ ...... SEBASTES
2. Anal III, 5. Vertebræ unknown.
a. Pectorals with lower rays prolonged in a linguiform lobe.
Ventrals under axils of pectorals, with outer rays produced, thick, unbranched .. SEBASTOLOBUS
II. Dorsal deeply notched, in two parts.
A. Dorsal spines, X+1. Anal III, 5–6.
1. Pectoral with medial rays branched. Low, inconspicuous spines on the vertex ...... SETARCHES
2. Pectoral simple. Head smooth, unarmed above .... [LIOSCORPIUS]

SCORPÆNA, Linnæus.

Scorpæna, ARTEDI, Genera, 17, XX, 47.—LINNÆUS, Systema Naturæ, ed. X, 1758, 266, (type, *Scorpæna porcus*).—GÜNTHER, Cat. Fish. Brit. Mus., II, 107.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 678, 679.

Scorpænids having the body oblong, somewhat compressed. Head large, not much compressed, naked above and armed with several series of spinous ridges, and with dermal flaps. A quadrate pit at the occiput, mouth large, with bands of villiform teeth on jaws, vomer, and palatines. Scales mostly ctenoid, of moderate size, often with skinny flaps, cheeks naked, opercles sometimes without scales. Dorsal fin with 12 stout spines; anal with 3 spines, the second commonly the longest; pectorals large, rounded, the base procurrent; the upper rays divided, the lower simple in all our species; ventrals inserted behind pectorals. No air bladder. Vertebræ 10+14.

This genus, which is widely distributed throughout the East Indian seas, is represented in the shore faunas of the Atlantic basin by two European and two tropical American forms. *S. Plumieri*, Schneider, occurs throughout the West Indies and north to the Bermudas, and is always a shoal water form. *S. brasiliensis*, C. & V., a smaller scaled form with shorter body, is a shore form from the coast of Brazil. The European forms both occur in the Mediterranean. The Italians have noted them from Genoa, Naples, and Sicily and around to the head of the Adriatic, the French from Nice, Cette, and Marseilles, and the Portuguese from Lisbon. Both have been observed in the Gulf of Gascony, at Biarritz and La Rochelle. *S. scrofa* has not been seen on the coasts of Vendee or farther north, but is abundant at Madeira, where there is also a local species, *S. ustulata*, to which it is closely allied. *S. porcus* follows the French coast as far north as Dieppe. Cuvier was entirely in error in supposing that it occurs in the western Atlantic, but appears to have had specimens from Teneriffe. Lowe's remarks about *Scorpæna scrofa* and its habits at Madeira are very important. He notices the tendency of this form to become modified for residence in deeper regions.

SCORPÆNA SCROFA OBESA, LOWE.

Scorpæna scrofa, AUCTORUM, (in part).
Scorpæna scrofa, var. *S. obesa*, LOWE, Fishes of Madeira, 1893, 105.

A *Scorpæna* with oblong body, whose height is 3½–4 times in its length, covered with scales of moderate size, there being 40–46 in the lateral line; the posterior ones are ciliated. Head longer than high, its length about one-third of total, scaleless and smooth. Interorbital space deeply concave. Occipital pit broader than long. Cirri upon head and trunk, larger along lateral line Third dorsal spine nearly half as long as the head. Second anal spine more than one-third as long as head.

Color yellowish red, the fins marbled with brown, a blackish blotch upon the body under the space between the sixth and tenth spines.

Radial formula: D. XI, I+9–10; A. III, 5; P. I, 8–10; V. I, 5.

The above description applies to the species as a whole. Lowe separates his variety *obesa* on the following specifications: "*Major, miniacea, pallida, maculis obsoletioribus; corpore altiore s. obeso; oculis fere majoribus.*"

S. scrofa obesa is a deep-water form, living "*in profundioribus, a littori procul.*" The fishermen of Madeira distinguish it, calling it *Carneiro de Fora*, while the inshore type is known as *Carneiro de Rolo.* They grow to be from 15 to 20 inches long, and have the belly somewhat more prominent, and larger eyes, and lighter colors. Lowe is not positive that the two forms should be distinguished, even as varieties. We include *obesa* among the deep-water forms in order to invite further investigation of the question whether *S. scrofa* may not be dimorphic like *Sebastes norvegicus.*

Risso distinguished a color, or depth, variety in this species at Nice, which occurred in the coralline zones, and was "*d' un brun rouge de laque, marbrèe de brun, de blanc et de gris couverte d'appendices dentelées et de cirrhes rougeatres*" (Hist. Nat. Europe Mérid., III, 371). He also describes a pallid form under the name *Scorpæna lutea.* This is not recognized by modern Mediterranean ichthyologists. Lowe suggests that it may be founded upon some extreme state of his *obesa.*

Scorpæna scrofa is preëminently a Mediterranean species. It has been observed at Nice, Cette, Genoa, Leghorn, Naples, Montecristo, Magdalena, Alghero, Cagliari (Corsica), Messina, Catania, Malta, Venice, Trieste, Dalmatia, and North Africa. Also from the River Niger, Lisbon, Gulf of Gascony, St. Jean de Luzon, Arcachon, Gironde, La Rochelle. Also from Madeira and the Azores.

Scorpæna ustulata, Lowe, Proc. Zool. Soc. 1860, 36, is a Madeiran form of small size, closely allied to *S. scrofa*, but with cheeks and opercles pustulate or granulated.

Two additional species are now added to the deep-sea forms of the Atlantic.

SCORPÆNA CRISTULATA, GOODE and BEAN, n. s. (Figure 242).

The greatest depth of the body (50 millimeters) is one-third of the standard length; the least height of the tail (14 millimeters) equals the length of the snout. The length of the head (68 millimeters) is contained $2\frac{1}{5}$ times in the standard length, and is about twice the length of the upper jaw. The width of the interorbital space (8 millimeters) is one-fourth the length of the upper jaw; this space is moderately concave and is incompletely scaled. The maxilla reaches to the vertical from the posterior edge of the pupil; its length (30 millimeters) is one-fifth of the standard length. The mandible reaches to below the posterior margin of the eye, its length (38 millimeters) slightly more than the postorbital part of the head. Teeth in villiform bands in the jaws and on the vomer and palate. A naked space at the symphysis of the intermaxillaries. A pair of spines on the preorbital; six spines on the suborbital carina; five on the border of the preoperculum, of which the uppermost is the largest, and with a supplementary spine at its base. Nasal spines developed; three supraorbital spines on each side and three more on each side of the vertex and nape. A postocular spine, a tympanic and two humerals. Two thin flat spines on the operculum. Almost all the spines of the head have short filaments behind them.

The length of the eye (20 millimeters) is contained nearly $3\frac{1}{2}$ times in the length of the head and equals two-thirds the length of the maxilla. The length of the snout (14 millimeters) equals the least height of the tail. The anterior nostril is nearer to the eye than to the tip of the snout; it is tubular and has prolongations behind consisting of two dark colored filaments. The longest filaments above the orbit are scarcely one-third as long as the eye. The posterior nostril is scarcely tubular; the distance between the anterior nostrils is one-half the length of the eye. The integument covering the supramaxilla is finely scaled. The character of the gill-rakers is very different from those of *Pontinus;* they are short, stout, and the club-shaped extremity is armed with minute spines. There are 4 developed and 2 rudiments above the angle and 8 below, besides 5 sessile rudiments. Pseudobranchiæ present. The distance of the spinous dorsal from the tip of the snout (67 millimeters) equals twice the length of the upper jaw. The length of the first spine (8 millimeters) equals the width of the interorbital space; the length of the second spine is nearly twice that of the first; the length of the third (22 millimeters) is about one-third the length of the head; the fourth is about equal to the third, the fifth is broken off, the sixth is slightly shorter than the third, and the rest decrease gradually in size to the penultimate spine, whose length (11 millimeters) is a little more than one-half the length of the last (19 millimeters). The longest ray of the soft dorsal (26 millimeters) equals one-half the length of the base of the spinous dorsal. Length of the middle caudal rays (32 millimeters) is nearly one-half the length of the head. The caudal is slightly rounded when expanded. The anal origin is under the last spine of the dorsal. The length of the anal base (17 millimeters) equals one-half of the postorbital part of the head. The spines are all stout, the length of the first (10 millimeters) is about one-half of the second (21 millimeters) and exactly one-half of the third (20 millimeters.) The length of the longest ray (24 millimeters) is about one third the length of the head. The ventral does not quite reach to the vent; its length (31 millimeters) slightly greater than that of the maxilla. The pectoral extends to the vertical from the tenth spine of the dorsal. It reaches, also, to above the vent. It has the lower 8 or 9 rays simple; the first ray, also, is simple, and the intervening 13 rays are divided.

Radial formula:—D. XII, 9; A. III, 5; V. I, 5; P. 23.

Scales in 8 rows between the origin of the second dorsal and the lateral line, and in 15 rows from the origin of the anal upward to the lateral line. About 35 tubes in the lateral line. About 60 rows of scales can be counted from the upper angle of the gill-opening to the caudal.

Color (in alcohol) light orange yellow; a faint dusky blotch on the upper part of the operculum. An irregular area of dusky under the second half of the spinous dorsal extending downward about to the middle of the body; another ill-defined blotch two-thirds as long as the eye on the basal half of the soft dorsal. The membrane of the spinous dorsal beginning behind the fourth spine is vaguely intermingled with dusky.

The type of the description is an example measuring 150 millimeters to base of caudal. Catalogue number 39326, from station 2415, steamer *Albatross*, N. lat. 30° 44′, W. lon. 79° 26′ (off Georgia), in 440 fathoms.

SCORPÆNA AGASSIZII, GOODE and BEAN, n. s. (Figure 243.)

The greatest height of the body (32 millimeters) is about one-third of the standard length. The least height of the tail (9 millimeters) equals one half the length of the third dorsal spine and nearly one-half the length of the maxilla The length of the head (38 millimeters) equals the length of the base of the spinous dorsal.

The greatest width of the head (21 millimeters) equals one half its length without the postorbital part. The width of the interorbital area (8 millimeters) is half the length of the postorbital part of the head. The length of the eye (15 millimeters) is contained 2½ times in the greatest length and 6 times in the standard length. The supraocular ridge is elevated above the general profile, and the snout is abruptly declivous and very short; its length (6 millimeters) is less than one-half the length of the eye. The maxilla reaches to the vertical from the posterior margin of the orbit, its length (20 millimeters) is one-half the length of the head and two-ninths of the standard length. The mandible reaches behind the vertical from the posterior margin of the orbit; its length (22 millimeters) equals nearly one-fourth of the standard length; it has a prominent knob at the symphysis. The strong preorbital spines overhang the supra-maxilla. The nasal spines small. Three spines at the top of the orbit, one in front and two behind. Two spines on each side of the vertex and one on each side of the nape; a tympanic and a humeral spine. Two spines on the operculum and five behind the border of the preoperculum, the first with a small supplementary spine at its base. Suborbital carina feeble, with three small spines. Top of head scaleless; sides of head incompletely scaled. Cephalic filaments all small, the longest one above the orbit about one-third as long as the eye. Six gill rakers above the angle and seven below. The distance of the spinous dorsal from the snout (37 millimeters) equals the length of its base. The length of the first spine (7 millimeters) is about one-half that of the second; the third, fourth, fifth and sixth are about equal in length, being about one-half as long as the head. The penultimate is about three-fourths as long as the last, whose length (15 millimeters) is about equal to that of the orbit. The longest dorsal ray (20 millimeters) is about one-half as long as the head. The caudal is very long, its middle rays (31 millimeters) about one-third the standard length. The anal origin is under the penultimate spine of the dorsal. The length of its base (16 millimeters equals the height of the body at the end of the anal; length of the first spine (7 millimeters) is one-half that of the eye; the second spine (13 millimeters) is nearly twice as long as the first, and the third (14 millimeters) is exactly twice as long as the first. The longest ray of the anal (21 millimeters) equals the length of the upper jaw. The vent is under the tenth dorsal spine. The pectoral is very long, reaching to above the end of the anal; its length (41 millimeters) more than that of the head. The ventral reaches to the origin of the anal, its length (24 millimeters) somewhat more than one-fourth of the standard length.

Radial formula:—D. XII, 9; A. III, 5; P. 20, the lower ten and the first simple.

Five scales between the lateral line and the origin of the soft dorsal; eleven between the origin of the anal and the lateral line, counting obliquely upward and backward; 47 rows between the upper angle of the gill-opening and the caudal; 28 tubes in the lateral line.

Color above light orange yellow, creamy white below the lateral line; the fins all pale.

The type of the description is a specimen measuring 90 millimeters to base of caudal. From station CCLIX, *Blake*, N. lat. 23° 13′, W. lon. 39° 10′.

BATHYSEBASTES, Steindachner and Döderlein.

Bathysebastes, STEINDACHNER & DÖDERLEIN, Denkschr. Akad. Wiss. Wien, XLIX, 1884, 207.—GÜNTHER, Challenger Report, XXII, 19.

Scorpænids with continuous, though somewhat notched, dorsal; twelve dorsal spines. Head naked above, with several series of spinous ridges. Cleft of mouth unusually wide. Bands of teeth in the jaws, on the vomer and palatines. Superficial bones of the skull with wide, muciferous cavities. Scales very small, cycloid; upper side of the head scaleless (or with scales on the lateral parts of the head hidden under the skin). Branchiostegals 7.

This genus has not been fully characterized, and it is difficult to see how it will finally be separated from *Scorpæna*.

It includes a single species, ***Bathysebastes albescens***, obtained from the Sea of Japan. Günther, though stating that "nothing definite is known about the depths which it inhabits," includes it in his list of deep-sea fishes.

HELICOLENUS, Goode and Bean n. g.

Scorpænids with body oblong, somewhat compressed; large head, ctenoid scales on its top, and on the cheeks and opercles. Several series of spinous ridges on the head, but no occipital pit. Mouth large, with bands of villiform teeth on jaws, vomer and palatines. Dorsal fin continuous, not deeply notched, with 10 stout spines and 10 to 12 rays. Anal with 3 spines and 6 rays. Pectorals broad, fan-shaped, with rays arranged in three groups: the first of two simple rays; the second of 8 or 9 branched rays; the third of 8 simple rays, sometimes prolonged, with their tips tendril-like and free from the membrane for half their length or less. The second dorsal with tips free from membrane. Suborbital keel smooth, or with a single anterior spine under the eye. Preorbital with the spines so conspicuous in *Pontinus*, small and hidden beneath the skin. Vertebræ 10 + 14. No air-bladder.

The type is the *Sebastes dactylopterus* of De la Roche. The genus occurs in the Mediterranean and adjacent parts of the Middle Atlantic, and off the coast of the United States south of Cape Cod.

HELICOLENUS DACTYLOPTERUS, (De la Roche) Goode and Bean. (Figure 244.)

Scorpæna dactyloptera, De la Roche, Ann. Mus. Paris, xii, 316, 337, Pl. xxii, fig. 9.—Risso, Ichthyologie de Nice, 1810, 186 (Nice); Hist. Nat. Eur. Méridionale, 1826, iii, 369.
Sebastes dactylopterus, Günther, Cat. Fish. Brit. Mus, ii, 1860, 99.
Sebastoplus dactylopterus, Goode and Bean, Bull. Mus. Comp. Zool., x, 214.—Jordan, Cat. Fish. N. Amer. 108.
Scorpæna (Pontinus) dactylopterus, Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus. 679.

A *Helicolenus* with body and head somewhat compressed, and back arcuate; its height at the ventrals 2¾ in its total length (without caudal); the length of the head about 2⅓. The second dorsal spine about equal in length to the fourth, and both shorter than the third. Scales moderate, finely pectinate upon the margins, presenting a rough surface. No dermal flaps. Preopercular spines five in number, somewhat conspicuous, and uniform in size, except the second, which is a little longer and sharper than the others. Upper margin of the eye touching upper profile of head, its diameter 3 to 3½ in length of head. Maxillary long, somewhat curved, its posterior extremity reaching about to the vertical from the posterior margin of the pupil. Lower jaw equal in length to the upper, or sometimes passing slightly beyond it. Upper jaw notched, the lower with a median tubercle corresponding to the notch.

The lateral line is distant from the dorsal outline a space equal to three-quarters the diameter of the orbit, and follows a nearly straight line to the point below the end of the soft dorsal, thence with a gentle curve to a point slightly above the middle of the base of the caudal. The number of longitudinal rows of scales is hard to determine. There appear to be about 50 and 28–30 of them are tube-bearing.

The dorsal fin is inserted above the inner, upper angle of the opercular flap, and the length of its spinous portion is considerably less than the length of the head. Its second, third and fourth spines are the longest, the third slightly exceeding the other two; while the following ones gradually decrease to the eleventh, which is considerably shorter than the tenth, which is equal to the fifth. The soft dorsal is composed of 12 rays, the last bifid; and its height at its middle is considerably greater than that of the third dorsal spine, and nearly equal to that of the postocular portion of the head; its rays project far beyond the membranes. The anal is inserted under the origin of the soft dorsal, and is nearly equal to it in height. The tip of the ventral extends beyond the vent, the lower pectoral rays sometimes going to the same vertical. The base of the pectoral is equal in width to the postocular portion of the head, and almost equal to its longest or median rays, which reach to the vertical from the vent; the fin is broad and fan shaped; its first two rays are simple, the nine following branched, the last eight simple and slender, nearly half of their extremities free from connecting membranes.

Color, red above, white below, with the color of the back extending in transverse bands upon the sides. Dark blotches or bands on the opercles and dorsal fin.

Radial formula: D. xii, 12-13; A. iii, 6; V. i, 6.

De la Roche states that at Iviça this form is found only at considerable depths, outside of the regions commonly frequented by the fishermen; indeed, that it is very rare, or scarcely at all known, in the markets of the towns where the fishermen are not in the habit of going far out to sea. He saw many individuals taken off Iviça at a depth of 260 to 290 meters, and in the vicinity of Barcelona saw the same species from a depth of 540 meters. At Iviça the species is known as the *Seran imperial*, and at Barcelona as the *Fanegal*.

Risso says that the specimens seen by him at Nice corresponded perfectly with the description and figure of De la Roche, and that it is very common in that part of the Mediterranean, where it is known as the *Cardouniera;* that it grows to a length of 30 centimeters and a weight of 2 kilograms; that it is obtained on rocky bottoms at considerable depths throughout the entire year, and that he has observed females full of eggs in summer. Canestrini identifies it from Naples under the name *Scorfano di funal*, and says it is known only at great depths. His diagnosis corresponds fairly well with that of De la Roche, but we do not know whether it is original or quoted. Giglioli identifies the same from Genoa, Messina, and Catania.

Outside of the Mediterranean it has been identified by Capello from Lisbon, where he says it is very rare and found only in summer.

Moreau says he has found it common at Marseilles, and identifies with the species individuals observed by him at St. Jean de Luz, where it is very common, and at Biarritz, where it is known by the Basque name *Crabra*; at Valence and at Arcachon, where it is exceedingly rare, M. Lafont having obtained a single specimen, trawled and brought to market in February, 1871.

The species also occurs in the western Atlantic in numerous localities, having been first discovered by the *Fish Hawk*, in 1880, off Narragansett Bay. The western form presents no characters by which it can be distinguished from that of the Mediterranean, except that the lower rays of its pectoral fin are somewhat more prolonged in the example studied by us. This also has a perfectly smooth suborbital keel, while most of the western specimens have a small spine on the anterior portion of this keel. This character is of little moment. In some of our specimens the spine is present on one side and absent on the other.

In comparing *H. dactylopterus* with *H. maderensis*, special attention should be paid to the preopercular spines. The limb of the preoperculum is much more nearly vertical in the Madeiran type, and the spines are more prominent, and their axes (as shown in Lowe's figure) are parallel with each other and with the central axis of the fish's body. This tendency to parallelism is noticeable in some of our specimens of *H. dactylopterus*. The Madeiran fish has a much more heavily armed head, and its coloration is different. The back part of the mouth of *H. dactylopterus* is plumbeous in both Mediterranean and American specimens, but it seems hardly probable that it can have been as conspicuously black as in that of Madeira.

In addition to the American specimens, we have had before us a specimen obtained by President Jordan at Genoa (U. S. Nat. Mus. Cat. No. 29783).

HELICOLENUS MADERENSIS, GOODE & BEAN, n. s.

Sebastes imperialis, LOWE, Synopsis, Fishes of Madeira, 175; Fishes of Madeira, 171, pl. XXIV.

A *Helicolenus*, with body moderately compressed, as high at the origin of the anal as at that of the dorsal, with its profile flatly arched to a height equal to about one-third the diameter of the orbit. Its greatest height, at the origin of the ventrals, is equal to the length of the head (measured from the tip of the snout), and slightly exceeds one-third the length of the body; the thickness, which is greatest behind the eyes, about one-half of its height.

Eye large, the upper limb of the orbit encroaching upon the upper profile of the head; its diameter equal to the length of the snout, but less than the postorbital portion of the head, and consequently less than one-third the length of the head. The interorbital space deep and strongly ribbed, its width scarcely one-half the diameter of the orbit; a prominent depression in the occipital region. Suborbital equally feeble, aculeate, with generally only one slight spine. Preoperculum with five strong spines, equidistant and regularly arranged, the uppermost, which is opposite the end of the suborbital keel, or sometimes one below it, a little the most conspicuous, all having the same horizontal or parallel direction, being nearly straight or but slightly hooking upwards. The scapulary and two suprascapulary spines small and crowded, forming the usual triangle. Two conspicuous spines upon the upper part of the opercular flap, below its angle; spines upon the anterior suborbital inconspicuous.

The teeth are not described by Lowe.

The dorsal begins slightly behind the upper anterior angle of the preoperculum, and (as shown in the figure) the roots of the first and second spines seem very close together. The second and fourth spines are nearly equal, the third slightly exceeding them in length; the fifth, sixth, and seventh are nearly equal; the eighth, ninth, and tenth slightly decreasing from one to the other, the ninth as long as the first, which exceeds the twelfth by as much as this exceeds the tenth, and the tenth exceeds the eleventh. This fin is less regular in the diminution of the length of its spines than that in *H. dactylopterus*.

The anal begins farther forward than in *H. dactylopterus*, apparently in the vertical from the base of the eleventh dorsal spine. The third anal spine is somewhat stouter and longer than the second; the tip of the anal, when extended, does not touch the vertical from the end of the base of the soft dorsal.

The pectoral is broad and fan-shaped, the width of its base about equal to the diameter of the orbit, the uppermost of its branched rays the longest, its middle rays about equal in length to the longest of the ventral, which, when extended, pass far beyond the vent, and almost, if not quite, to the origin of the anal. The rays of the pectoral are arranged precisely as in *H. dactylopterus*. Caudal simple and truncate.

Lateral line straighter than in *H. dactylopterus*, but slightly curved in its course from the head to the middle of the caudal peduncle, and twice as far from the anterior portion of the soft dorsal as from that of the spinous portion of the fin. It consists of 29 or 30 scales, each with a little spine-like point, directed toward the tail. The scales (as shown by the figure) are larger than in the Mediterranean form. Color pale scarlet, with darker or brighter broad, irregular, scarlet bands, often subdued with dusky, running down the side from the dorsal origin and disappearing after reaching the ventral origin. Fins scarlet, immaculate, the spiny part of the dorsal fin being mottled, and having its spines and filaments tipped with white, and its soft portion, like the front of the ventral and anal fins, edged with white. Head bright scarlet, the operculum with a patch of bluish black. The back part of the mouth lead color, the front of mouth and tongue whitish. Iris golden, shaded with brown; pupil violet, opalescent.[1]

This species is taken by the Madeiran fishermen on rocky bottoms and at great depths, with lines 225 to 350 fathoms in length. It is taken chiefly in spring and autumn, neither of which times, according to Lowe, is its breeding season, so that he is inclined to believe that like *P. dactylopterus*, as observed by Risso, the spawning time is in summer. The Madeirans call it the *Boca negra*, or black mouth, in allusion to its conspicuous black throat, and it is also called *Pai di gato*, or "tomcat," a name which refers to the fact that the eyes glisten strongly in the dark.

The name *Sebastes imperialis* has no significance. Cuvier and Valenciennes had no specimens except the types of De la Roche, and renamed it from some whimsical desire to utilize the vulgar name "*Scrofanu imperali*," which the Sicilians use for some fish which the French ichthyologists supposed to be identified with that described from Iviça.

Specimens of this species were taken by the *Fish Hawk* as follows: Cat. No. 26723, U. S. N. M., from station 897, in 37° 25′ N. lat., 74° 18′ W. lon., at a depth of 157½ fathoms; Cat. No. 28954, U. S. N. M., from station 1033, in 39° 56′ N. lat., 69° 24′ W. lon., at a depth of 183 fathoms; Cat. No. 28827, U. S. N. M., from station 914, in 40° 01′ N. lat., 71° 14′ 30″ W. lon., at a depth of 128 fathoms; Cat. No. 28847, U. S. N. M., from station 950, in 40° 07′ N. lat., 70° 32′ W. lon., at a depth of 71 fathoms; Cat. No. 31658, U. S. N. M., from station 1109, in 40° 03′ N. lat., 70° 38′ W. lon., at a depth of 89 fathoms; Cat. No. 29060, U. S. N. M., from station 1027, in 40° N. lat., 69° 19′ W. lon., at a depth of 93 fathoms; Cat. No. 28754, U. S. N. M., from station 939, in 39° 53′ N. lat., 69° 50′ 30″ W. lon., at a depth of 264 fathoms; Cat. No. 28957, U. S. N. M., from station 1032, in 39° 56′ N. lat., 69° 22′ W. lon., at a depth of 208 fathoms; Cat. No. 26627, U. S. N. M., from station 897, in 37° 25′ N. lat., 74° 18′ W. lon., at a depth of 157½ fathoms; Cat. No. 28998, U. S. N. M., from station 1043, in 38° 39′ N. lat., 73° 11′ W. lon., at a depth of 130 fathoms; Cat. No. 31871, U. S. N. M., from station 1152, in 39° 58′ N. lat., 70° 35′ W. lon., at a depth of 115 fathoms; Cat. No. 31874, U. S. N. M., from station 1151, in 39° 58′ 30″ N. lat., 70° 37′ W. lon., at a depth of 125 fathoms; Cat. No. 29050, U. S. N. M., from station 1045, in 38° 35′ N. lat., 73° 13′ W. lon., at a depth of 312 fathoms; and Cat. No. 28980, U. S. N. M., from station 1038, in 39° 58′ N. lat., 70° 06′ W. lon., at a depth of 130 fathoms.

The *Albatross* also secured specimens from the following localities: Station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms; from station 2545, in 40° 01′ N.

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[1] Lowe states that in several large examples taken in August the color was the most brilliant scarlet imaginable, with the bands deeper, but pure, intense scarlet. The eye was singularly beautiful. The anal fin was broadly edged in front with white.

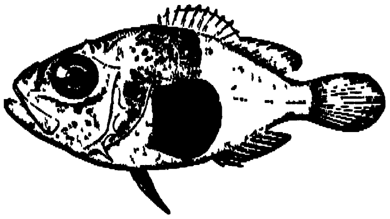
lat., 70° 23′ 45″ W. lon., at a depth of 142 fathoms; from station 2544, in 40° 01′ 45″ N. lat., 70° 24′ W. lon., at a depth of 131 fathoms; from station 2264, in 37° 07′ 50″ N. lat. 74° 34′ 20″ W. lon., at a depth of 167 fathoms; from station 2540, in 39° 58′ 20″ N. lat., 70° 52′ W. lon., at a depth of 144 fathoms; from station 2548, in 39° 56′ N. lat., 70° 14′ 30″ W. lon., at a depth of 200 fathoms; from station 2109, in 35° 14′ 20″ N. lat., 74° 59′ 10″ W. lon., at a depth of 142 fathoms; from station 2265, in 37° 07′ 40″ N. lat., 74° 35′ 40″ W. lon., at a depth of 70 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon., at a depth of 280 fathoms; Cat. No. 35687, U. S. N. M., from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms; Cat. No. 32805, U. S. N. M., from station 2011, in 36° 38′ 30″ N. lat., 74° 40′ 10″ W. lon., at a depth of 81 fathoms; Cat. No. 35479, U. S. N. M., from station 2200, in 39° 53′ 30″ N. lat., 69° 43′ 20″ W. lon., at a depth of 148 fathoms; Cat. No. 35472, U. S. N. M., from station 2184, in 40° 00′ 15″ N. lat., 70° 55′ 30″ W. lon., at a depth of 136 fathoms, and Cat. No. 32812, U. S. N. M., from station 2014, in 36° 41′ 05″ N. lat., 74° 38′ 55″ W. lon., at a depth of 373 fathoms.

The schooner *Josie Reeves* obtained a single specimen (Cat. No. 28998, U. S. N. M.) in 40° 01′ N. lat., 71° 02′ W. lon., at a depth of 125 fathoms.

PONTINUS, Poey.

Pontinus, POEY, Mem. Hist. Nat. Cuba, II, 1858, 172.
Sebastoplus, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 208.—JORDAN, Rep. U. S. F. C., 1885 (1889), 679.

Scorpænids similar in form and general structure to *Helicolenus*, but having the pectoral rays all simple and their tips only free; having six to nine rays in the anal; the suborbital keel composed of three distinct, differentiated, flat, knife-like spines, and two prominent retrorse spines on each suborbital.



A YOUNG PONTINUS.

The type of this genus is *Pontinus castor* (Poey), which, with the allied species, *P. pollux*, described at the same time, is probably a shoalwater form, peculiar to the West Indian fauna. The genus is apparently precisely equivalent to Gill's *Sebastoplus*, described by him in 1863, of which *Sebastes Kuhlii* was designated as the type.

KEY TO THE DEEP-SEA SPECIES OF PONTINUS.

I. Base of pectoral broad; fin fan shape. Lateral line curved at its origin.
A. Second dorsal spine longer than fourth.
1. Second and third dorsal spines longest.
a. Five preopercular spines, "60 scales in longitudinal series" (Günther). About 30 tubes in lateral line .... P. KUHLII
b. Four preopercular spines. "12 scales in longitudinal series" (Sauvage).......... P. BIBRONII
2. Second dorsal spine much the longest.
a Four preopercular spines (32 tubes in lateral line?) .... P. FILIFER
B. Second dorsal spine shorter than or equal to fourth.
1. Scales small, finely pectinate, rather irregular. Laciniæ on head. Preopercular spines irregular
a. Third and fourth dorsal spines longest.
* End of dorsal and anal opposite.......... P. CANARIENSIS
** End of anal considerably in advance of that of dorsal. About 26 tubes in lateral line.......... P. RATHBUNI
b. Third dorsal spine conspicuously longest. About 22 tubes in lateral line .....P. MACROLEPIS
II. Base of pectoral narrow, and the fin slender. Lateral line straight.
A. Third dorsal spine longest.
1. Ventrals reaching vent. No laciniæ. Scales regular, carinate.......... P. LONGISPINIS
2. Ventrals not reaching vent. Laciniæ. Pacific coast, N. A .... [P. SIERRA]

PONTINUS KUHLII, (BOWDICH), GOODE and BEAN.

Scorpæna Kuhlii, BOWDICH, Excursions in Madeira, 123.
Sebastes Kuhlii, LOWE, Trans. Zool. Soc. London, II, 176; Synopsis Fishes of Madeira, 176; Fishes of Madeira, 115, pl. XVII.—GÜNTHER, Cat. Fish. Brit. Mus., II. 102.—CAPELLO, Jorn. Accad. Sci. Lisboa, 1; Cat. Peix. Portugal, 1880, 11.—VAILLANT, Exp. Sci. Travailleur et Talisman, 370.
Sebastoplus Kuhlii, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 208.

A *Pontinus*, having an oblong, somewhat compressed body, the height of which at the origin of the ventral is contained about 3 times in its total length (caudal excluded); the length of its head 2½ times. The space between the eyes slightly concave, with two low ridges, its width about one-eleventh the length of the head. Snout as long as the diameter of the orbit; lower jaw projecting considerably; the vertex is much depressed and has several prominent spines, and there are long, lanceolate laciniæ upon the margin of the orbit and in front of it. The upper maxillary reaches about to the vertical from the middle of the eye. There are 3 prominent spines upon the suborbital carina, and a long, sharp spine in continuation of them upon the preoperculum, with 3 or 4 less conspicuous spines below it and one above. The dorsal is continuous and comparatively slightly notched, the twelfth and ninth dorsal spines being nearly as long as any except the first, second, and third, while the first, tenth, and eleventh are also about equal. The anterior dorsal ray is about equal in height to the fourth spine, and the fin from that point curves sharply in a subvertical, fan-shaped outline to the caudal peduncle; the second and third dorsal spines are much longer than the others. Anal inserted under the second dorsal ray, with 3 stout spines, of which the third is the longest, being longer than the fourth dorsal ray, and with 5 rays, closely set together, and as long as the longest dorsal rays. Pectoral with broad, crescentic base, fan-shaped, when expanded reaching from the ventral line to the lateral line. Ventrals as long as the longest dorsal spine, and inserted directly under the pectoral base, the antecedent spine as long as the second spine of the anal. Color red, irregularly blotched with brown.

Radial formula: D. XII, 9–10; A. III, 5; V. I, 5; about 25 tubes in the lateral line.

This species, the *Requieme*, was first found in Madeira, and was named by Bowdich, and described by Lowe. The fishermen take it about Madeira with lines of 100 to 250 fathoms in length. It grows to be from 12 to 15 inches long, and to weigh from a pound to a pound and a quarter. The British Museum has specimens from the Canaries, and Capello records it from Lisbon. It has not as yet been found in the Western Atlantic or in the Mediterranean though *Sebastes Bibroni* of Sauvage may prove to be the same. The French expedition obtained it off the coast of Soudan in 670–1139 metres in the Banc d' Arguin, 175–2330 metres, and others, 520 millimeters long off Palmas. It may be readily distinguished from any other species of *Pontinus* by the great prominence of the second and third dorsal spines. Vaillant has printed an elaborate description of its scales.

PONTINUS BIBRONII, (SAUVAGE), GOODE AND BEAN.

Sebastes (*Sebastichthys*) *Bibroni*, SAUVAGE, Nouvelles Archives du Museum, Paris, I, 1878, 116, pl. I, fig. 3 (scales).

A *Pontinus*, with the posterior extremity of the maxillary not passing beyond the vertical from the center of the eye. Teeth in the middle of the upper jaw longer than the others. Pharynx colorless. Four spines on the preoperculum, the upper one the longest; 2 spines, pointing backward, on the anterior suborbital. Eye small. Second anal spine longer than the third. Anal extending to the base of the caudal. Pectorals a little longer than the ventrals, which do not extend to the vent. Second and third spines of the dorsal longer than the others. Scales rounded, the anterior limb nearly entire, the posterior limb armed with numerous rows of little spines, of which those on the edge are long. Color red, with numerous black blotches, arranged in three series, one along the back, and two others above and below the lateral line.

Radial formula: D. XII, 10; A. III, 5; scales in lateral line 42; above 13, below 28.

This species is described from a specimen 20 centimeters long, collected in Sicily by M. Bibron. Though similar in appearance to *Helicolenus dactylopterus*, this species, as

Sauvage declares, appears to be distinct. It is distinguished by the less oblique profile of the head, smaller eye, shorter maxillary, colorless pharynx, the teeth in the middle of the upper jaw shorter, 4 spines on the preoperculum instead of 5, the anal shorter, and the scales different in character. Another distinctive character is the presence of 2 strong spines on the suborbital.

The space between the posterior margin of the eye and the origin of the dorsal is more arched than in the other species. The height is contained four times in the length of the head; the opening of the mouth is more horizontal; the interocular space flatter and narrower between the two crests, which are less conspicuous. The occipital pit is nearly square. The suborbital crest has 3 spines, while in *H. dactylopterus* scarcely any spines are visible.

The teeth of the vomer are arranged in the form of a ʌ, with angles less divergent than in the other species. Between the vomerine patch and the palatines there is a considerable interval; the palatine band narrower anteriorly and more curved. The anterior edge of the maxillary is less notched, the muzzle blunter. The preopercular space is shorter; the lateral line is straighter in its anterior portion. The space between the extremity of the dorsal and the origin of the caudal is shorter. The second and third spines of the dorsal are much longer than those which follow, while in *H. dactylopterus* the spines diminish regularly in height. The fins are uniform brownish-red; the caudal has a few black blotches.

This species, which Sauvage considers allied to *Helicolenus dactylopterus*, does not belong to the same genus. It is suspiciously close to *Pontinus Kuhlii*, but we deem it unsafe to assume its specific identity in species from localities even so close together as Sicily and Madeira. The description of Sauvage is therefore translated in full, and the attention of Mediterranean ichthyologists is especially directed to the desirability of obtaining further material in regard to this genus in their waters.

PONTINUS FILIFER, (VALENCIENNES), GOODE and BEAN.

Sebastes filifer, VALENCIENNES, in Webb and Berthelot, Hist. Nat. Iles Canariennes, Poissons, 1836, 21 pl. II, fig. 2.

A *Pontinus* with a comparatively low dorsal convexity, its height at the origin of the anal about two-thirds that at the origin of the dorsal, which enters 2⅔ into the total length (without caudal); length of head about 2½ times in total length. Eye small, its diameter about two-thirds the length of the snout, and contained about four and one-half times in that of the head: it touches but does not encroach upon the upper profile, and (as shown by the figure of Webb and Berthelot) this profile is not deeply depressed, either in front or behind it. Interorbital space nearly flat, its width two-thirds the diameter of the eye, with two strong crests, each terminated by a spine. Suborbital crest sharp, composed of 3 nearly equal pointed spines. Posterior extremity of the maxillary extending about to the vertical from the posterior limb of the orbit. Tongue free. Teeth in broad bands upon the jaws, longest in the middle. Vomerine teeth in the form of a ʌ, with wide angle.

Dorsal fin planted far back, not far in front of the axil of the pectorals. The base of the spinous dorsal is nearly one third as long as the body; its second spine is much the longest, slender, recurved, its length about twice that of the fourth spine, which is about equal to the twelfth and twice as long as the first. The spines following the fourth decrease in very slow and gradual gradation to the eleventh, the seventh to the eleventh inclusive being nearly equal; the third is midway in length between the second and the fourth; the soft dorsal is as high as the second spine.

The origin of the anal is in the vertical from that of the second dorsal; its end in the vertical from the preantepenultimate dorsal ray, its first spine is similar in size and shape to the first of the dorsal; its second to the fourth of the dorsal, though stouter; its third to the fifth of the dorsal. The base of the pectoral is rather narrow, its width about equal to the length of the snout. Its rays are apparently all simple, the middle ones the longest and nearly as long as the longest dorsal spine, and extending to the vertical from the origin of the anal. The tips of all the rays are free, those of the middle ones most so.

The anal is inserted under the axil of the pectoral, its single spine slender and longer than the fourth of the dorsal, its longest rays exceeding those of the second dorsal, and when extended backwards passing far beyond the vent and almost to the anal.

The lateral line is almost straight, and (as shown in the figure) has 36 to 38 tubes. This corresponds closely to Sauvage's account; he records 12 scales above and 29 below the lateral line.

Scales broad, with three or four rows of strong spines upon their posterior limb. Color, body reddish-yellow with numerous black blotches on each side of the lateral line; blackish on the back and on the head. Dorsal and caudal spotted with black, other fins light.

Radial formula: D. XII, 10; A. III, 5.

This species, described by Vaillant from the Canaries, was obtained off those islands by Webb and Berthelot, who record that it lives at a depth of 250 fathoms, in company with *Sebastes imperialis*. It is called by the Canary fishermen *Rascazio de fuera*, while its companion is the *Rubio colorado*. This species is closely related to *P. Kuhlii*.

PONTINUS CANARIENSIS, (SAUVAGE), GOODE and BEAN.

Sebastes (*Sebastichthys*) *canariensis*, SAUVAGE, Nouvelles Archives du Museum, Paris, I, 1878, 117, pl. I, figs. 1, 2.

A *Pontinus*, with its greatest height more than 2⅓ times in its total length (without caudal); the length of the head about 2⅓. Eye moderate, its diameter about equal to the length of the snout and contained 3⅔ times in the length of the head. Its upper limb encroaches strongly upon the upper profile, which is much depressed in front and behind it. Interorbital space quite broad, with 2 low crests. Occipital region depressed, provided on each side with 3 strong crests, the two posterior ones connected by an inconspicuous crest. Two strong spines on the snout; two spines on the anterior suborbital. Preoperculum with 4 spines (in the figure 3, of which only the two upper ones are conspicuous). A very strong spine in the axil of the pectoral. The extremity of the maxillary extending almost to the vertical from the posterior margin of the orbit. A suborbital horizontal crest, with 2 feeble spines at its posterior end. The maxillary, the lower part of the preoperculum, and the under part of the mandible scaleless. The first anal spine short, stout, its length about half that of the second anal spine, which is nearly as long as the soft rays of the fin.

Dorsal with 12 spines, of which the third and fourth are the longest, the fourth slightly exceeding the third; the fifth, sixth, and seventh nearly equal; the eighth and the eleventh somewhat shorter; the second and the ninth shorter still; the tenth still less, but exceeding the twelfth, which in its turn is longer than the first. The length of the base of the spinous dorsal about equal to the length of the head. The soft dorsal with 9 rays (10 shown in the figure), rounded, highest at its middle, the longest ray being about equal to the third spine. Original of anal under the second or third dorsal ray, and the extremity of its base opposite that of the soft dorsal. Pectoral and ventral fins nearly equal in length, and when extended their tips reach to the origin of the anal. The 10 lower rays of the pectoral simple, and with tips only free.

Scales broad in proportion to their length, with 3 rows of spines upon their upper margin, the outermost the largest. Anterior limb straight. The figure shows 22 to 23 tubes in the lateral line. Sauvage's account of 57 scales in the longitudinal row signifies little. He registers 15 above and 29 below.

Color red, with some brown blotches along the back.

Radial formula: D. XII, 9–10; A. III, 5.

The type of this species was brought from the Canaries by Webb and Berthelot, and was 18 centimeters in length. It is to all appearances a deep-sea form, and very closely related to *P. Rathbuni*, which follows.

PONTINUS RATHBUNI, GOODE and BEAN, n. s. (Figure 245.)

The greatest depth of the body (46 millimeters) is contained about 2¼ times in the standard length. The least height of the tail (13 millimeters) equals the length of the eye. The length of the head (52 millimeters) is nearly twice the length of the mandible (27 millimeters), and is contained in the standard length about 2⅓ times. The greatest width of the head (28 millimeters) equals the length of the middle caudal rays. The width of the interorbital area (5 millimeters) is one-fourth of the interorbital part of the head; it is not very deeply concave and has a few scales. The top of the snout, also, is fully provided with scales. The length of the eye (13 millimeters) is one-half the length of the mandible. The length of the snout (13 millimeters) is equal to that of the eye. The maxilla extends nearly to the vertical from the posterior margin of the eye; its length (23 millimeters) is contained 2¼ times in that of the head and equals one-half the greatest height of the body. The mandible reaches beyond the vertical from the posterior margin of the eye, its length (26 millimeters) equaling that of the postorbital part of the head and twice the length of the eye. Eight developed gill-rakers below the angle and 5 rudiments, 2 above the angle and 5 rudiments. The gill-rakers are very slightly expanded at the end and the longest is a little more than 2 millimeters in length. Pseudobranchiæ well developed. Teeth in villiform bands in the jaws and on the vomer and palate. A naked space at the symphysis of the intermaxillaries. The distance of the anterior nostril from the front of the eye equals the distance from its fellow of the opposite side; it is in a tube which has an elongated narrow extension behind, ending in two or three small filaments. The posterior nostril is scarcely tubular and is placed close to the anterior. A pair of recurved spines on the preorbital, a pair between the nostrils, four spines forming the suborbital carina, four spines on the border of the preoperculum, the uppermost with a supplementary spine at its base. The first and third spines larger than the others. A pair of compressed flat spines on the operculum; a pair of spines at the front of the orbit above and a pair above the orbit on each side posteriorly. A spine on each side of the vertex, and a pair on each side of the nape. A single posterior spine on each side and two humeral spines.

A very short and slender filament above the orbit in front, a large supraoccipital filament, which expands at the top into a semi-leaf-like tip. A small slender filament between the nuchal spines, a combined filament behind the lower preorbital spine. The length of the longest supraoccipital filament (19 millimeters) is about two-thirds the length of the eye.

The head is entirely scaly above with an expansion of the integument covering the supramaxilla.

The distance of the spinous dorsal from the tip of the snout (45 millimeters) is contained 2⅔ times in the standard length, and is equal to the length of the base of the spinous dorsal. The length of the first spine (9 millimeters) is one-half that of the second spine, (18 millimeters); the length of the third and longest spine (24 millimeters), equal to the length of the upper jaw. The length of the penultimate spine (12 millimeters), equal to one-half the length of the upper jaw. The length of the last spine (13 millimeters) is equal to that of the eye. The length of the base of the soft dorsal (30 millimeters) is one-fourth of the standard length. The length of the third and longest ray (20 millimeters) is one-sixth of the standard length. The length of the middle caudal ray (28 millimeters) is contained 4¼ times in the standard length. The tail is nearly truncate when expanded. The anal origin is under the second ray of the dorsal. The length of the anal base (16 millimeters) equals two-thirds the length of the upper jaw. The length of the first spine (9 millimeters) is three-fourths the length of the eye; the length of the second spine (23 millimeters) equals the length of the maxilla; the length of the third (19 millimeters) is about twice that of the first. The length of the longest ray (23mm.) equals that of the second spine. The last ray (15 millimeters) is nearly equal to the base of the fin. The vent is under the tenth spine of the dorsal. The pectoral rays are all simple; the tenth is the longest, its length (30 millimeters) equal to one-fourth of the standard length. The fin reaches slightly beyond the vent when extended, but does not reach to above the origin of the anal; the ventral reaches to the vent; the length of its spine (17 millimeters) is about one-third the length of the head. The length of the second ventral ray (27 millimeters) is a little more than one-half the length of the head.

Radial formula: D. XII, 10; A. III, 5; V. I, 5; P. 17.

General color light-orange yellow; 6 dark blotches on the upper surface, the first of which is on the nape, the second at the beginning of the spinous dorsal, the third under the fourth spine of the dorsal, the fourth beginning under the seventh spine of the dorsal, the fifth at the origin of the soft dorsal, and the sixth near the end of the soft dorsal. The largest of these blotches is about two-thirds as long as the eye. Soft dorsal with numerous roundish dark blotches on the skin covering the rays. Caudal marked like the soft dorsal, other fins pale. In life the species was probably roseate.

The type of the description is an individual measuring 119 millimeters to base of caudal. Catalogue number, 39325; from station 2298, *Albatross*, N. lat. 35° 39′, W. lon. 74° 52′, 80 fathoms.

This species is closely related to *P. vanariensis*, but may be distinguished by the greater number of scales in the lateral line, by the shorter pectorals, the ventrals, which when extended reach to the line of the vent only, by the more advanced position of the anal, the termination of whose base is under the base of the antepenultimate dorsal ray; by the greater length of the second anal spine, which is longer than the third, and nearly three times as long as the first; by the character of the suborbital crest, which is high and sharp and has its surface notched into three portions, so that it appears to be composed of three long depressed spines; by the presence of laciniæ in the occipital region; by the more advanced position of the pectoral, whose base is almost hidden under the branchiostegal membrane, its anterior spine being close to the edge of the opercular flap.

The contour of the dorsal is much the same, save that the spines are more slender and the notch less deep, the eleventh spine being equal to the tenth, and not much shorter than the ninth.

Pontinus Rathbuni is dedicated to Mr. Richard Rathbun, chief of the Division of Scientific Inquiry in the U. S. Fish Commission, in recognition of his important contributions to marine zoölogy.

PONTINUS MACROLEPIS, Goode and Bean, n. s. (Figure 247.)

A *Pontinus* having pectoral rays all simple as in *P. longispinis*, *P. Kuhlii*, and *P. castor*, and larger scaled than either of those. We have compared it with *Pontinus castor* of Poey, and while it belongs to the same genus it is a much larger scaled species than Poey's and the supraoccipital filaments are much less developed. The greatest depth of the body (30 millimeters) is about one-third of the standard length; the least height of the tail (8 millimeters) equals the length of the snout. The length of the head (41 millimeters) is equal to one-half the total length to the end of the dorsal. The greatest width of the head (21 millimeters) is about one-half its greatest length. The width of the interorbital area (4 millimeters) is about one-half the length of the snout. The interorbital region is deeply concave and scaleless; top of snout also scaleless. The length of the eye (13½ millimeters) is about one-third the length of the head. The length of the postorbital part of the head to the end of the opercular flap (19 millimeters) equals one-half the distance from the tip of the snout to the origin of the spinous dorsal. The maxilla reaches beyond the vertical from the middle of the eye and the mandible to below the end of the eye. The length of the maxilla (20 millimeters) is one-half the length of the head. The length of the mandible (21 millimeters) equals the length of the ventral. Four rudiments and 2 developed gill-rakers above the angle; 9 developed below the angle. The developed gill-rakers have a little knob at the end. Teeth in villiform bands in the jaws and on the vomer and palatine bones. A naked space at the symphysis of the intermaxillary pieces into which is received a projecting spur at the tip of the mandibles, mandible with a slight knob below and with three large pores along the middle of its surface. Pseudobranchiæ well developed.

A pair of spines between the nostrils, a pair at the top of the orbit in front, a pair of supraoccipitals continued backward by two additional pairs on the vertex, two pairs on the nape. A tympanic spine. A pair of humeral spines. Two stout, flat spines on the preopercle, 4 on the preoperculum, of which the uppermost is the largest and the third is larger than the second and fourth. The uppermost, also, has a supplementary small spine at its base. Sub-orbital carina consisting of 3 spines, 2 on the preorbital, both of which bend backward. A very short filament above the orbit in front and another one behind, whose length (4 millimemeters) is about one-third that of the eye. The head is entirely scaly with the exception of the top of the snout, and the integument covering the supramaxilla and the gill rakers has the same structure. The anterior nostrils are tubular, the tube produced behind into a thin narrow flap; the anterior nostril is at a distance from the eye equal to the interorbital width. The posterior nostril is not tubular. The distance of the dorsal from the tip of the snout (36 millimeters) is twice the length of the maxilla. The length of the first spine (10 millimeters) is about two-thirds the length of the the second (14 millimeters), the third and longest spine (16 millimeters) is one-half as long as the head without the snout. The penultimate spine (8 millimeters) is nearly as long as the first, and the last spine (10 millimeters) is about one-half the length of the upper jaw. The longest ray of the dorsal (12 millimeters) equals one-third of the distance from tip of snout to dorsal.

The length of the middle caudal rays (20 milimeters) is about one-half the length of the head. The caudal is almost truncated behind. The anal originates under the second ray of the dorsal; the length of its base (10 millimeters) is one quarter the length of the head. The length of the first spine (7 millimeters) is about two-thirds the length of the anal base; the length of the second (17 millimeters) is about one-fifth of the standard length; length of third spine (13 millimeters) is about equal to that of the eye. The longest ray (16 millimeters) is equal to the longest spine of the dorsal.

The longest ray of the pectoral (25 millimeters) equals the distance from the vent to the origin of the ventral. Pectoral when extended reaches to the vent or to the vertical from the penultimate dorsal spine. The ventral origin is under the base of the pectoral. The fin reaches to the vent, its length (22 millimeters) a little greater than that of the mandible. There are about 6 rows of scales, counted obliquely, from the origin of the dorsal to the lateral line and about 10 below the line. There are about 22 tubes in the lateral line.

Radial formula: D. XII, 10; A. III, 5; P. 17; V. I, 5.

The colors of the alcoholic specimens have faded out. The type is now a very light orange; fins all pale. There are faint traces of the existence of dusky blotches along the back in life.

The colors of the fresh specimen were as follows: Uniform rosy intermingled with pearly white; the light areas most conspicuous on the fins. Anterior part of anal more intensely colored than any other part of the fish. Cephalic tentacles pale; the posterior supraocular pair with a little band of rose a little below the middle of the height. Pupil an intense blue. Iris golden above and below, overlaid with rosy, greenish golden anteriorly and posteriorly. Belly and throat pearly white. The light areas on the caudal simulate bands.

The type of the description is a single small individual measuring 88 millimeters to the base of the caudal; total length, 110 millimeters, from station 2354, *Albatross*, N. lat. 20° 59′ 30″, W. lon. 86° 23′ 45″, off Yucatan, from a depth of 130 fathoms.

PONTINUS LONGISPINIS, GOODE and BEAN, n. s. (Figure 246.)

The peculiar form of the spinous dorsal, noticeably in *P. Kuhlii*, is quite marked in our new species—that is to say, the third spine is longer than the fourth, and much longer than the first and second. The gill-rakers also are stout, rather short, and not numerous, while the pectoral rays are all small. The species is not so deep-bodied as *S. Kuhlii*, the greatest depth of the body (40 millimeters) being a little less than one-third of the standard length. The least height of the tail (12 millimeters) is one-fourth of the length of the head. The length of the head (50 millimeters) is about two-fifths of the standard length; greatest width (27 millimeters) is a little more than one-half its length. The width of the interorbital area (7 millimeters) is one-half the length of the eye, which is about equal to the length of the snout. The length of the eye (15 millimeters) is contained 3⅓ times in that of the head, or 1⅓ times in the length of the postorbital part of the head. The maxilla reaches to below the middle of the eye; its length (23 millimeters) is one-half the distance from the tip of the snout to the spinous dorsal. The mandible extends slightly farther back than the maxilla, its length (26 millimeters) about one-half the length of the head. Teeth in the jaws in villiform bands. At the symphysis of the intermaxillaries there is a slight interspace separating the two enlarged club-shaped ends of the bone. The vomerine patch in a very narrow triangular band; the palatine bands also are very narrow; pseudobranchiæ well developed; 12 developed gill-rakers on the anterior arch, of which 9 are below the angle besides the rudiments. A pair of spines between the anterior nostrils; a pair of spines on the front of the preorbital; three forming a ridge across the cheek; 4 on the preoperculum, of which the one at the middle of the border is the largest; 2 on the operculum; a pair of spines above the front of the orbit; 3 small supraorbitals, 2 nuchal, 1 postorbital, and 2 at the origin of the lateral line; no filaments about the head. Cheeks and opercles scaly. Scales on the nape and on the top of the snout. The sides of the snout are naked, and there are no scales on the integument covering the maxilla. The ridges of the spines of the head and of the scales are exactly the same as in *P. Kuhlii* and the gill-rakers have the same structure. The anterior nostrils are tubular, distant from the eye about one-third the eye's diameter, and its distance from its fellow of the opposite side (7 millimeters) is nearly one-half the length of the eye. The spinous dorsal originates a little in front of the base of the pectoral; its distance from the tip of the snout is twice the length of the maxilla. The length of the first spine (9 millimeters) is one-half that of the fourth spine; the length of the second spine (13 millimeters) is scarcely more than one-half the length of the third spine (25 millimeters). The fourth spine is considerably shorter than the third, and the spines gradually decrease in length, so that the eleventh is a little shorter than the second. The length of the twelfth spine (16 millimeters) is about equal to the length of the snout. The length of the longest ray of the second dorsal (19 millimeters) is nearly one half of the base of the spinous dorsal. The caudal is very slightly emarginate; the length of the middle rays (31 millimeters) is about one-fourth of the standard length. The anal origin is under the first ray of the soft dorsal; the length of the base of the fin (16 millimeters) is nearly one-third of the length of the head. The length of the first spine (8 millimeters) is nearly one third that of the second spine (26 millimeters). The length of the third spine (26 millimeters) is 2½ times that of the first. The length of the longest ray (22 millimeters) is 1½ times that of the last ray (15 millimeters). The pectoral origin is under the interspace between the second and third dorsal spines; the fin reaches, when extended, almost to the end of the spinous dorsal or to the thirteenth pore of the lateral line. The ventral is under the pectoral; the length of its spine (22 millimeters) nearly equal to the length of the maxilla. The fin reaches about tc the vent when extended; the length of the longest ray (27 millimeters) is a little more than one-half the length of the head. The vent is under the ninth spine of the dorsal; its distance from the origin of the anal (9 millimeters) is equal to one-third of its distance from the origin of the ventral.

D. XII, 10; A. III, 5; P. 16; V. I, 5.

Scales 7 | 49 | 13. 25 pores in lateral line.

Color of the alcoholic specimen, light orange. Caudal with a few small, dusky blotches; the other fins pale.

This description is based upon an example measuring 126 millimeters to the base of the caudal. It was taken along with two smaller individuals at station 2402 by the steamer *Albatross*, N. lat. 28° 36′, W. lon. 85° 33′ 30″, in 111 fathoms; another small example was taken by the *Albatross* at station 2401, in N. lat. 28° 38′ 30″, W. lon. 85° 52′ 30″, 142 fathoms.

SEBASTES, Cuvier.

Sebastes, CUVIER, Règne Animal, 1829, II, 166.—CUVIER & VALENCIENNES, Hist. Nat. Poiss., IV, 326.—GÜNTHER, Cat. Fish. Brit. Mus., II, 95 (part).—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 207.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 651.

Scorpænids with head and body compressed; head scaly above and on sides, with one or two pairs of spine-tipped cranial ridges. Mouth broad, oblique; the maxillary reaching below the eye, broad, short, and extended at its tip; lower jaw projecting, with the knob at its symphysis dwindling into a notch in the upper jaw. Villiform teeth on jaws, vomer, and palatines. Eye very large, and close to the upper profile. Preopercle strongly armed with 5 divergent spines; opercle with 2 spines. Supracapular spines prominent.

Scales small, ctenoid, irregular. No laciniæ upon head or body.

Fins perciform. Dorsal moderately notched, with 15 spines and an equal number of rays, more closely planted than the spines. Anal with 3 spines and 7 or 8 rays. Pectorals long and narrow. Caudal emarginate. Branchiostegals, 7. Vertebræ, 12+19.

The type of this genus is *Perca marina* of Linnæus, but the generic name was rather whimsically derived from the common name borne in the Balearic Islands by a fish of another genus, the *Scorpæna dactyloptera* of De la Roche, already discussed.

SEBASTES MARINUS, (Linnæus), White. (Figure 248.)

Perca marina, Linnæus, Syst. Nat., ed. x, 1758, 483; ed. xii, 290.—Pennant, Brit. Zoöl., ed. 1, iii, 258, pl. xlviii; ed. 2, iii, 349, pl. lix.

Sebastes marinus, White, Catalogue of British Fishes, 8.

Cyprinus pelagicus, Linnæus, Fauna Suecica, i, 1764, 320.

Perca norwegica, Müller, Zoologiæ Danicæ, 1779, 46.—Fabricius, Fauna Grænlandica, 167.

Sebastes norvegicus, Cuvier and Valenciennes, iv, 1829, 327, pl. lxxxvii.—Yarrell, Brit. Fish., ed. 1, 73, cut; ed. 2, i, 87; ed. 3, ii, 72.—Jenyns, Brit. Vert., 347.—Richardson, Faun. Bor.-Amer., Fish., 52.—Storer, Rep. Fish. Mass., 26; Hist. Fish. Mass., 1867, 38, pl. vii, fig. 1.—DeKay, Zoöl. N. Y., Fish., 60, pl. iv, fig. 2.—Kröyer, Danm. Fiske, 270.—Thompson, Nat. Hist. Ireland, iv, 82.—Günther, Cat. Fish. Brit. Mus., ii, 95; Challenger Report, xxii, 17.—Malmgren, Ofvers. Sven. Vet. Akad. Förh., 1865, 508.—Collett, Norges Fiske, 19.—Lütken, Vid. Medd., 1876, 358.—Goode and Bean, Bull.' Essex Inst., xi, 14.—Day, Fish. Great Britain and Ireland, i, 42, pl. xviii.—Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 651.

Holocentrus norvegicus, Lacépède, Hist. Nat. Poiss., iv, 319.

Scorpæna norvegica, Richardson, *op. cit.*, 52.—Jenyns, *op. cit.*, 347.—Johnson, Berwickshire Nat. Club, i, 1838, 170.

Serranus norvegicus, Fleming, British Animals, 212.—Johnson, Mag. Nat. Hist., vi, 1833, 15.

Sebastes septentrionalis, Gaimard, Voy. Islande et Groënland, Poissons, pl. ix.

A *Sebastes* with compressed body, elevated dorsal outline and straightish ventral outline.

Top of head sealy; interorbital space concave, with two low ridges; cranial ridges moderate, rather low and sharp; preocular, supraocular, postocular, tympanic and occipital ridges present, the latter with divergent tips; suprascapulary spines sharp and prominent, opercular spines long and sharp, subopercular spine prominent; preopercular spines slender and sharp, the second longest. Suborbital stay not reaching preopercle; preorbital narrow, with two spines.

Eye very large, more than twice as long as interorbital space, and one-third as long as head. Mouth large, oblique, with broad maxillary, which reaches middle of eye; tip of lower jaw much projecting, with a conspicuous knob at symphysis; mandible and maxillary scaly.

Pseudobranchiæ very large; gill-rakers long, stiff, and strong.

Dorsal fin deeply emarginate, with sharp spines, the longest about equal to diameter of eye; soft rays higher than the spines. Caudal narrow, moderately forked. Anal spines moderate, graduated, the second a little shorter than eye. Pectoral with narrow base and rather long, reaching vertical from vent. Ventral reaching to vent. Scales small, irregular, not strongly ctenoid; about 40 tubes in the lateral line, and about 85 scales in longitudinal series.

Color: red, nearly uniform, sometimes a dusky opercular blotch, and about five vague dusky bars on the back. Peritoneum brownish.

Radial formula: D. xv, 13; A. iii, 7.

This well known form is abundant between the hundred fathoms line off the south coast of New England, and has been found as low as 180 fathoms. It breeds abundantly in late summer at these depths, and there is no reason to believe that the young rise to the surface. The fry were caught by the bushel in the trawl net, and were eaten on the *Fish Hawk*, cooked after the manner of "whitebait."

The species was known from the western Atlantic as early as the time of Cuvier, who had specimens sent from Miquelon, Newfoundland, by M. de la Pilaie. It was, however, originally described from Norway by Linnæus, and seems to have been mentioned by Olafsen about Iceland as early as 1774. Linnæus ascribed it also to the Mediterranean, but, as Cuvier has shown, it is very evident that the southern fish which he had in mind was *Serranus scriba* (compare *Systema Naturæ*, 12th edition, pp. 483 and 486). It has never been found south of the British Channel, and the figure by Day was obtained by him from Utrecht or Leyden, but he does not say whether or not it was from Dutch waters. Day gives a number of localities of its capture about the British Isles, but it is rare south of Faroe Islands.

It occurs on the southwest coast of Spitzbergen (Malmgren, loc. cit.), and on the Norwegian coast it is found everywhere from Christiania around to the Varanger Fiord. It also occurs in Greenland, and from Labrador, as a shore form, as far south as Maine (See Essex Fishes), and in deeper water, as shown in the accompanying list, as far south as 39° 48.′ The Norwegian expedition obtained it as deep as 147 fathoms, and American vessels down to 179.

Specimens of this species have also been found by the steamer *Albatross* in the following localities: No. 33370, U. S. N. M., from station 2067, in 42° 15′ 25″ N. lat., 65° 48′ 40″ W. lon., at a depth of 122 fathoms; No. 33501, U. S. N. M., from station 2088, in 39° 59′ 15″ N. lat., 70° 36′ 30″ W. lon., at a depth of 143 fathoms; No. 33507, U. S. N. M., from station 2090, in 39° 59′ 10″ N. lat., 70° 41′ 10″ W. lon., at a depth of 140 fathoms; No. 33389, U. S. N. M., from station 2061, in 42° 10′ N. lat., 66° 47′ 45″ W. lon., at a depth of 115 fathoms; No. 33381, U. S. N. M., from station 2053, in 42° 02′ N. lat., 68° 27′ W. lon., at a depth of 105 fathoms; No. 33409, U. S. N. M., from station 2063, in 42° 23′ N. lat., 66° 23′ W. lon., at a depth of 141 fathoms; and from station 2430, in 42° 58′ 30″ N. lat., 50° 50′ W. lon., at a depth of 917 fathoms; station 2522, in 42° 20′ N. lat., 65° 07′ 30″ W. lon., at a depth of 104 fathoms; station 2560, in 39° 48′ 10″ N. lat., 71° 48′ 40″ W. lon., at a depth of 114 fathoms; station 2431, in 43° 00′ N. lat., 50° 47′ 30″ W. lon., at a depth of 129 fathoms, and station 2580, in 41° 25′ 30″ N. lat., 69° 01′ W. lon., at a depth of 83 fathoms. Others (No. 31536, U. S. N. M.) were taken by the steamer *Fish Hawk* off Cape Cod at a depth of 55 fathoms. The *Speedwell* also obtained ten specimens (No. 21814, U. S. N. M.) from station 138, in 42° 33′ N. lat., 70° 26′ W. lon., at a depth of 59 fathoms.

SEBASTES MARINUS VIVIPARUS, (KRÖYER).

Sebastes viviparus, KRÖYER, Naturhist. Tidsskr., I, 1844-'45, 275.—GAIMARD, Voy. Scand., Poissons, VI.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 333.—GÜNTHER, Cat. Fish, Brit. Mus., II, 96; Challenger Report, XXII, 18.—GRAY, Ann. and Mag. Nat. Hist. (1), 1, 1868, 312.—GOODE and BEAN, Bull. Essex Inst., XI, 1879, 14.—STRÖM, Norsk. Vid. Selsk. Skrift. 1881, 73; 1884, 16.—LILLJEBORG, Sveriges Fisk., 101.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus. 632.

This form is recognized by certain Scandinavian zoölogists and by Günther in his later writings as a distinct species. No very salient characters have been pointed out, save that it is smaller, has a higher body, and longer head, a narrower interorbital space, longer pectoral and ventral fins, and an additional soft ray in dorsal and anal. Jordan describes its general color as brownish red, somewhat mottled, with a blackish blotch on the opercle, and some other brownish spots on the body, as if he had identified this form from American waters. All those we have seen are more like the *S. viviparus* type. Günther says that it is found in Scandinavian waters at a depth of 300 fathoms. It is generally understood to be more littoral in its habits than *S. marinus*.

SEBASTOLOBUS, Gill.

Sebastolobus, GILL, Report, Smithsonian Institution, 1880 (1881), 375.

Scorpænids with vertebræ as in the typical species of *Sebastes* and characterized by the pectorals having a wide base, produced backwards near the upper margin, and not medially, while the lower rays are thickened and extend much beyond the rays next above in a linguiform lobe. The ventrals are directly under the axils of the pectorals, with the outer rays produced, thick and branched.

This genus has as yet been found only in the Pacific. The type is *Sebastolobus macrochir* (Günther) Gill, (Challenger Report, I, 1880, part VI, 65, Pl. xxvii), obtained by the *Challenger* off Inosima, at a depth of 345 fathoms. Another species, *S. alascanus*, Bean (Proc. U. S. Nat. Mus., XIII, 1890, 44), was obtained by the *Albatross* at station 2853, off Trinity Islands, Alaska, in N. Lat. 56°, W. Lon. 154°, at a depth of 159 fathoms.

SEBASTODES, Gill.

Sebastodes, Gill, Proc. Acad. Nat. Sci. Phila., 1863, 207.

Scorpænids with the dorsal continuous, though somewhat notched, and with thirteen spines in the dorsal and nine rays in the anal. Skull thick and cranial ridges weak. Lower jaw much projecting. Teeth in villiform bands on jaws, vomer, and palatines. Scales small, ninety to one hundred in the lateral line.

This genus is represented by a single species, *S. paucispinis*, (Ayres), Jordan and Gilbert, found on the coast of California "in rather deep water." Deep-sea representatives of the genus should be looked for on our Northwest coast.

SEBASTICHTHYS, Gill.

Sebastichthys, Gill, Proc. Acad. Nat. Sci. Phila., 1863, 207.

Scorpænids with the dorsal continuous, though somewhat notched, and with thirteen spines in the dorsal and five to nine in the anal. Skull thick and cranial ridges weak. Lower jaw projecting but slightly. Teeth in villiform bands on jaws, vomer, and palatines. Scales moderate, forty-five to eighty in the lateral line.

This genus is represented on the Northwest coast and adjacent deep waters by forty or more species, nine or ten of these having been described as new by Gilbert,* from the bathybial fauna explored by the *Albatross* in 1888. These occur outside the 100-fathom line, and to as great a depth as 266 fathoms. As might have been expected, the genus of bottom-living fishes most abundant in species and numbers along the shores of this coast, has contributed the largest quota to the inshore deep-water fauna of the adjacent ocean.

SETARCHES, Johnson.

Setarches, Johnson, Proc. Zool, Soc. London, 1862, 176.—Jordan and Gilbert, Bull. XVI, U. S. N. M., 682.

Scorpænids with head and body compressed, the head flat between the eyes, with several low ridges. Head scaleless, its bones cavernous. No transverse groove on the occiput. Preoperculum and operculum strongly armed with straight, long spines. Eye moderate, near but not touching the profile. Mouth terminal, broad, somewhat oblique, the posterior edge of the maxillary extending to opposite the posterior part of the eye, and much expanded. Lower jaw somewhat projecting, with knob at symphysis received in rostral notch. Villiform teeth in jaws, on vomer and palatines.

Opercles scaly. Scales cycloid, moderate. Lateral line a broad, scaleless groove, with a series of skinny tubes. No laciniæ.

Dorsal fin deeply notched, so as to appear in two portions; dorsal spines 10–1, the soft portion of the fin shorter, and with rays fewer than spines. Anal with 3 strong spines inserted under the end of the dorsal. Pectoral fin broad and long, with 20 or more rays, of which a considerable number of the medial ones are branched. Branchiostegals 6 or 7. Pyloric appendages few. No air bladder.

The type is *Setarches Güntheri* (Johnson), from Madeira, undoubtedly from deep water, since only one specimen appears to have ever been taken. The genus *Lioscorpius* (Günther) can scarcely be distinguished from *Setarches*.

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* Proceedings, U. S. N. M., XIII, 48–126.

KEY TO THE SPECIES OF SETARCHES AND LIOSCORPIUS.

I. Head with low, parallel ridges above, and a few inconspicuous spines ....SETARCHES
  A. Body elongate (height at ventrals less than length of head)
    1. Snout long, spines on preorbital retrorse.
      a. Pectoral very elongate, extending beyond middle of anal ....S. GÜNTHERI
    2. Snout not much longer than eye. Spines on preorbital antrorse.
      a. Pectoral fan-shaped, not reaching to origin of anal..............................S. FIDJIENSIS
  B. Body less elongate (height at ventrals equal to or greater than length of head).
    1. Snout moderate. No spines on preorbital.
      a. Pectoral elongate, placed high...... ....S. PARMATUS
II. Head smooth above, and with muciferous cavities...... ....LIOSCORPIUS
  A. Body moderately elongate; head and snout very long.
    1a Head without spines, except three upon preopercle and two on opercle.
      a. Pectoral moderate, its upper rays longest, not reaching to origin of anal.......L. LONGICEPS

SETARCHES GÜNTHERI, JOHNSON.

Setarches Güntheri, JOHNSON, Proc. Zoöl. Soc., London, 1862, 177, pl. XXIII.

A *Setarches* having body and head elongate; the height of the body over ventrals equal to height under antepenultimate dorsal spine, and contained nearly 4 times in length of body (without tail); length of head 2⅓ in length of body.

Head not much compressed. Width of interorbital space 1½ times the diameter of the eye, which is somewhat below the profile. No conspicuous ridges upon the top of the head, but two low, flat, occipital spines. Snout 1⅔ times as long as the diameter of the eye. Mouth wide, somewhat oblique; maxillary with a much expanded posterior extremity, reaching nearly to vertical from posterior margin of orbit. Lower jaw projecting, with a strong, bony tubercle at its symphysis. Sides of head strongly armed. Three slender, sharp, closely set, parallel spines, of which the middle one is slightly the longest, at the angle of the suboperculum, and 2 smaller spines on its lower limb. Two long, strong spines upon the opercular flap. Two strong, retrorse spines upon the preorbital, their points projecting down over the maxillary.

Head scaleless, except upon the opercle. Scales small, cycloid, there being about 86 in the longitudinal series. The lateral line passing with a broad, gentle curve under the notch between the two dorsals, from a point very near the dorsal profile to the middle of the base of the caudal. It has no scales, but conspicuous skinny tubes, of which the figure indicates 28 to 30. Dorsal insertion in advance of that of pectoral, with the first spine about half as long as the diameter of the eye, and separated somewhat from the second, which is the longest, and more than twice the eye; followed by others which gradually and irregularly decrease in length to the tenth, which is about equal to the first, which is followed behind the notch by a slender one as long as the sixth. Nine soft dorsal rays, the longest as long as the first dorsal spine, but the length of the base of this fin is less than half that of the spinous dorsal. Anal inserted under the posterior portion of soft dorsal, with 3 spines and 5 rays. Ventral under the first dorsal spine, its longest rays equal to the external caudal rays. Pectoral very broad at its base, which occupies nearly half the height of the body, and with 22 rays, of which the first two and the last five are simple, the remainder branched; the upper branched rays are very long, one third as long as the body, and reach beyond the origin of the anal. Caudal truncate, its middle rays as long as the soft dorsal.

Color, uniform pink-red, minutely dotted with black.

Radial formula: D. X-XI, I, 9; A. III, 5; P. 2+15+5; V. I, 5; C. 4+7+4.

A single specimen, 9 inches long, now in the British Museum, was found by Johnson at Madeira and named in honor of Dr. Günther. The depth of its habitat was not at that time observed, but from what is known of the habits of its associates, it can not be doubted that it is a deep-sea form.

S. fidjiensis, Günther, was obtained by the *Challenger* at station 173, off Matuku in the Fiji Islands, at a depth of 315 fathoms, a single specimen 3 inches long. It is shorter than

S. Güntheri,[1] with a shorter and higher dorsal, a shorter, more rounded pectoral, with the preorbital spines antrorse and the preopercular spines slenderer, more uniform in size, more divergent, and four in number. The four ridges of the vertex terminate each in a sharp spine, visible from the lateral aspect.

SETARCHES PARMATUS, GOODE. (Figure 249.)

Setarches parmatus, GOODE, Proc. U. S. N. M., III, 480, Feb. 16, 1881.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 1883, 213.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 683.—GÜNTHER, Challenger Report, XXII, 19.—VAILLANT, Exp. Sci., Travailleur et Talisman, 375.

A *Setarches* having head and body short and somewhat compressed; the height of the body over ventrals greatest, and contained about 2½ in total length (without caudal) length of head 2⅓ in length of body.

Head somewhat compressed. Width of interorbital area equal to diameter of eye, which is somewhat below the profile. Ridges on top of head low and inconspicuous; two extending to the occiput, where they terminate in low, flat spines; two short ones over the posterior margin of orbit, ending in spines slightly behind the orbit. Snout as long as the orbit. Mouth wide, somewhat oblique; maxillary with a considerably expanded posterior extremity, reaching nearly to the vertical from posterior margin of orbit. Lower jaw scarcely projecting, and without prominent knob at symphysis. Sides of head lightly armed, there being four slender, elongate spines on the preoperculum; the edge of the suborbital is broadly scalloped with two points projecting in downward direction opposite the anterior and posterior margin of the orbit. Spines on the operculum small and inconspicuous. Two slender spines upon the preorbital, the anterior one touching the opening of the mouth. Head scaleless save upon the operculum, pre- and suboperculum. Scales small, cycloid, each with several concentric furrows. Lateral line broad, scaleless, with skinny tubes, of which there appears to be about 30 (an exact count not possible); the lateral line is practically concurrent with the line of the back. Dorsal insertion in advance of that of pectoral; the first spine more than half as long as second, and equal to ninth; the second as long as the seventh; the third and fourth about equal, and a little longer than the maxillary; the fifth, sixth, seventh and eighth gradually decreasing. There are 12 spines and 10 soft rays, the fin being deeply notched.

The type, as the drawing indicates, is somewhat deformed, owing to an accident in life, but a comparison with the other related species enables us to judge very nearly of what its shape must have been. Anal inserted under posterior part of soft dorsal, with 3 spines and 5 rays, the longest of which—about equal to the last spine—are as long as the second dorsal. Ventral in vertical from root of second dorsal spine, with 1 spine and 5 rays, its tip not reaching to vent, which is close to origin of anal. Pectoral broad at its base, elongate, some of its median rays apparently branched, its tip extending beyond the origin of the anal.

MEASUREMENTS.

Current number of specimen	26084	
Locality	Station 876.	
	Millimeters.	100ths of length.
Extreme length	52	
Length to base of middle caudal rays	43	100
Body:		
Greatest height		38
Greatest width		23
Least height of tail		9
Head:		
Greatest length		45
Width of interorbital area		10
Length of snout		10
Length of operculum		18
Length of upper jaw		23
Diameter of orbit		12

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[1] Günther, Challenger Report, XXII, 19, pl. I, fig. C.

MEASUREMENTS—Continued.

Current number of specimen Locality	26084 Station 876.	
	Millimeters.	100ths of length.
Dorsal:		
Distance from snout		42
Length of base		34
Greatest height at fourth spine		23
Height at first spine		10
Height at second spine		18
Height at third spine		22
(*Soft*) length of base		Mutilated.
Anal:		
Distance from snout		80
Length of base		12
Height at first spine		7
Height at second spine		14
Height at third spine		14
Height at longest ray		15
Caudal:		
Length of middle rays		24
Pectoral:		
Distance from snout		44
Length		44
Ventral:		
Distance from snout		44
Length		25
Dorsal		XI, I, 10
Anal		III, 6

The steamer *Blake* obtained two specimens of this species, 53 millimeters and 52 millimeters long, respectively, from station CCCXXVII, in 34° 00′ 30″ N. lat., 76° 10′ 30″ W. lon. at a depth of 178 fathoms; and two specimens from station XCVII, off Barbadoes, at a depth of 209 fathoms.

Specimens were taken by the *Albatross* from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon. at a depth of 280 fathoms; and from station 2426, in 36° 01′ 30′ N. lat., 74° 47′ 30″ W. lon., at a depth of 93 fathoms.

LIOSCORPIUS, Günther.

Lioscorpius, GÜNTHER, Challenger Report, I, Part VI, p. 40, pl XVII, fig. C.

Scorpænids with head and body compressed, the former with muciferous cavities above, and with scarcely any ridges or spines. Occiput without groove, naked. Three strong sharp spines upon the preoperculum and two upon the opercular flap. The mouth very large, the snout elongate, the curve of the mouth being downward. Orbit encroaching upon upper outline of head. Body covered with small scales, and with a wide, naked lateral line with about 28 skinny tubes. Dorsal fins separate; the first low, with eight or nine spines, the first, second, and third evenly graduated. Pectoral fin long, lanceolate, with simple rays. Teeth villiform in bands in the jaws and on the vomer and palatine bones. Branchiostegals VII.

The type of this genus is *Lioscorpius longiceps*, Günther, loc. cit., pl. XVII, fig. C, which closely resembles *Setarches parmatus* in form, except that its head and snout are longer, and the upper jaw curves downward. The genus seems well enough separated from *Setarches* by the smooth, grooveless occiput and the simple character of the rays of the pectoral.

Family COTTIDÆ.

Cottoideæ, RICHARDSON, Fauna Boreali-Americana, 1836, 36.

Cottidæ, GIRARD, Cottidæ of N. America, 1858, 1.—GILL, Arr. Fam. Fishes, 1872, 6 (No. 55), Proc. U. S. Nat. Mus. XI, 1889, 590.

Cottini, BONAPARTE, Catalogo Metodico, 1846, 62.—GÜNTHER, Cat. Fish. Brit. Mus., II, 152.

Cottoids with a well-developed myodome; uninterrupted cranial valleys behind. Body fusiform or compressed. Interocular space usually narrow. A bony stay connecting suborbital and preopercle, usually covered by skin; upper angle of preopercle usually with one or more spinous processes. Teeth in villiform or cardiform bands on jaws, and (usually) on vomer and palatines; premaxillaries protractile; maxillary without supplemental bone.

Gills $3\frac{1}{2}$ or 4; slit behind the last gill small, or obsolete; gill-rakers short, tubercle-like, or obsolete; gill-membranes broadly connected, often joined to the isthmus. Body naked, or with scales, prickles, or plates, but never uniformly scaled. Lateral line simple. Dorsal fins separate or somewhat connected, the spines less than thirteen in number, usually slender, the soft part elongate, longer than spinous portion; caudal rounded; anal similar to soft dorsal, spineless; pectorals large, with broad, procurrent bases; ventrals thoracic (rarely entirely wanting), the rays usually less than I, 5. Pseudobranchiæ present, at least in all our species. Pyloric cæca usually in small number (4–8); air-bladder commonly wanting.

KEY TO THE DEEP-SEA GENERA.

I. Spinous dorsal not concealed.
A. Gill openings extending below at least to the base of the lowest pectoral ray..............COTTINÆ
1. Slit behind last gill obsolete.
a. Gill membranes free from isthmus, or else forming a broad fold across it; head well armed.
Palatines toothless. No true scales on body.................................COTTUS
Palatines with well-developed teeth. Body more or less scaly.
Upper preopercular spine hooked, bifurcate.
Body with some scales or plates..ICELUS
Body naked..ARTEDIELLUS
Upper preopercular spine with 3–5 hooked processes........................ICELINUS
2. Slit behind last gill evident.
Palatines toothless.
Gill membranes free from isthmus; series of plates along back and along lateral line.
No plates on head; space between lateral plates prickly..................TRIGLOPS
Plates on snout and opercles..............PRIONISTIUS, Bean — RADULINUS, Gilbert
II. Spinous-dorsal little developed, continuous with soft dorsal, the spines slender, concealed in the loose naked skin; gill membranes broadly joined to isthmus; no slit behind last gill......PSYCHROLUTINÆ
A. Vomer and palatines toothless...PSYCHROLUTES
B. Vomer with teeth.
1. Gill membranes attached to isthmus.
a. Teeth on vomer and palatines. Dorsal continuous..........................COTTUNCULUS
b. No teeth on vomer and palatines. Dorsal in two parts....................MALACOCOTTUS
2. Gill membranes free from isthmus.
a. Vomerine teeth in two patches, none on palatines. Dorsal in two parts........[DASYCOTTUS]

COTTUS, Linnæus.

Cottus, LINNÆUS, Syst. Nat. Ed., x, 1758, I, 207, ed. 2, 1766, 1,451.—GÜNTHER, Cat. Fish. Brit. Mus. II, 155.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 700.
Acanthocottus, GIRARD, Smithsonian Contributions to Knowledge, III, 1858.

Cottids with body rather slender, subfusiform, covered with thick skin, in which are sometimes embedded prickly plates, especially along lateral line; deciduous granular tubercles also sometimes present, but no true scales. Head large. Mouth terminal, large, the lower jaw included; villiform teeth on the jaws and vomer, none on the palatines; suborbital stay strong; preopercle with 2 strong straight spines above, directed backward, and 1 below, directed downward and forward; opercle, nasal bones, orbital, rim, and shoulder girdle usually armed; gill membranes forming a fold across the rather narrow isthmus; slit behind last gill small or wanting, often reduced to a mere pore; vertebræ about 28. Branchiostegals mostly 6. Dorsal fins 2, separate, the first short, its spines rather slender; ventral rays usually I, 3.—(*Jordan and Gilbert.*)

Several species of this genus are found at a depth of 10 to 15 fathoms on our New England coast. None have, however, been taken below the 100-fathom line, saving *C. bathybius*, Günther, from south of Yeddo, Japan.

ICELUS, Kröyer.

Icelus, KRÖYER, Naturhist. Tidsskr., I, 253, 1844 (type, *Icelus hamatus*, Kröyer).—GÜNTHER, Cat. Fish. Brit. Mus., II, 172.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 689.

Cottids with body fusiform, covered with rough scales or plates. Mouth rather large; teeth on vomer and palatines. Head naked, usually with cirri; preopercular spine hooked, bifurcate or multifurcate. Gill-membranes broadly united, free from the isthmus, no slit behind fourth gill. Ventral rays I, 3.

In addition to the type species, an Arctic form, descending in the North Atlantic below the 100-fathom line, there are two or three others, found in moderately deep water off the California coast. Jordan unites with this genus *Artedius*, but we prefer, for the present at least, to consider it distinct.

ICELUS BICORNIS, (REINHARDT), JORDAN and GILBERT.

Cottus bicornis, REINHARDT, Vid. Selsk, Natur og Math. Afh., VIII, lxxv.
Centridermichthys bicornis, GÜNTHER, Cat. Fish. Brit. Mus., II, 172.
Icelus bicornis, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 693.
Icelus hamatus, KRÖYER, Nat. Hist. Tidsskr., 1844, I, 253.—GÜNTHER, Cat. Fish. Brit. Mus., II, 172; Challenger Report, XXII, 63.—COLLETT, Norges Fisk., 35; Forh. Vid. Selsk. Christ., 1880, 14; Norsk Nordh. Exped. Fisk., 34, tab. I, fig. 8; Nyt Mag. f. Naturvid, XVIII, 1884, 56.—LÜTKEN, Kara-Havets Fisk. in Dijmphna-Togtet, 123; Vid. Med. Nat. For., 1876, 92.—STRÖM, Norsk. Vid. Selsk. Skrift., 1884, 18.—LILLJEBORG, Sverig. och. Norg. Fisk., 161.
Icelus furciger, MALM, Forhandl. Skand. Naturf., 9 Mote, 1865, 410.
Cottus polaris, SABINE, Parry's First Voyage, 213 (*fide* Lütken).

Head naked, its length 3 times in that of body. Preoperculum with 4 spines, the upper 3 hooked, the uppermost bifurcate; two blunt, occipital spines. Interocular space narrow, its width 4 in eye. Dorsal separated; pectorals shorter than head. No air-bladder. Gill-membranes broadly joined, free from isthmus.

Radial formula: D. IX, 20; A. 16; V. I, 3.

Color, yellowish, with many brown spots.

This form, first described from Spitzbergen, has since been found also in Alaska. It is common in Arctic seas at small depths; of late years it has been frequently found on the Norwegian coast in 50 to 250 fathoms. Lütken examined numerous examples from 46 to 106 fathoms, obtained in the Kara Sea.

ARTEDIELLUS, Jordan.

Artediellus, JORDAN, Cat. Fish. N. America, 1887, 110; Rep. U. S. Fish. Comm., XIII (for 1885), 1887, 898 (type, *Cottus uncinatus*, Reinhardt).

This genus or subgenus differs from *Icelus* proper, apparently its nearest ally, in having the skin naked and smooth. *Centridermichthys*, Richardson, an Asiatic genus to which this and other American species have been sometimes referred, has the skin prickly and a large slit behind the fourth gill, the gill membranes being fully united to the isthmus.

ARTEDIELLUS UNCINATUS, (REINHARDT), JORDAN. (Figure 255.)

Cottus uncinatus, REINHARDT, Vid. Selsk. Natur. och Math. Afhandl., 1833, 11.—GÜNTHER, Cat. Fish. Brit. Mus., II, 172; Challenger Report, XXII, 1887, 62.
Centridermichthys uncinatus, COLLETT, Norsk. Nordh. Exped. Fisk., 23, tab. I, fig. 7; Forh. Vid. Selsk. Christ., 1880, 14; Nyt Mag. f. Naturvid., XVIII, 1884, 54.—LÜTKEN, Kara-Havets Fisk. in Dijmphna-Togtet, 124.—LILLJEBORG, Sverig. och Norg. Fisk., 161.
Icelus uncinatus, KRÖYER, Nat. Tid., 1844, 253.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 693.
Cottus bicornis, REINHARDT, *loc. cit.*, VIII, 75.
Artediellus uncinatus, JORDAN, *loc. cit.*

Body fusiform, its height contained 4½ times in its total length. Head broad, its length one-third that of the body; lower jaw included. Palatine teeth well developed. Maxillary extending to opposite middle of pupil. Eyes very large, separated by a narrow ridge; occiput with two blunt ridges, in front of which the vertex is concave; upper preopercular spine large, strongly hooked upward, more than half length of eye; downward-directed spine on preopercle long and sharp; skin perfectly smooth. Pectorals reaching front of anal; spinous dorsal rather high; vent midway between snout and middle of caudal. (*Jordan and Gilbert.*)

Radial formula: D. VIII, 13; A. 11.

"An Arctic littoral species," writes Günther, "more or less common in the sea between Greenland, Spitzbergen, Nova Zembla, and Norway, extending in the western part of its range southwards to the coast of New England. The Norwegian North Atlantic expedition has obtained specimens down to 223 fathoms (off Bear Island), and therefore the species is included in this report. As bathybial characters, the width of the pores of the muciferous system and the relatively large eye may be mentioned."

It has been identified by Dawson from the Pleistocene of Ottawa (Dawson, Canadian Record, IV, 86.)

Specimens of this species were taken by the *Speedwell* from station 156, in 42° 35′ N. lat., 70° 31′ W. lon., at a depth of 42 fathoms; station 222, in 42° 33′ N. lat., 70° 31′ W. lon., at a depth of 40 fathoms; station 211, in 42° 38′ N. lat., 70° 28′ 30″ W. lon, at a depth of 68 fathoms; station 213, in 42° 38′ N. lat., 70° 28′ 30″ W. lon., at a depth of 68 fathoms; station 233, in 42° 30′ 30″ N. lat., 70° 38′ W. lon., at a depth of 45 fathoms; station 234, in 42° 30′ N. lat., 70° 38′ W. lon., at a depth of 43 fathoms; and No. 21069, U. S. N. M., from station 33, in 42° 30′ N. lat., 70° 20′ W. lon., at a depth of 90 fathoms.

The *Fish Hawk* obtained specimens (No. 31809, U. S. N. M.) from station 1088, off Cape Cod, at a depth of 110 fathoms, and No. 31807, U. S. N. M., froms tation 1125, in 40° 03′ N. lat., 68° 56′ W. lon., at a depth of 291 fathoms. A specimen was collected by the Gloucester fishermen on the fishing banks in 1878.

Additional specimens were secured by the *Albatross* in the following localities: Station 2431, in 43° 00′ N. lat., 50° 47′ 30″ W. lon., at a depth of 129 fathoms; station 2463, in 45° 44′ N. lat., 54° 27′ W. lon., at a depth of 45 fathoms; station 2450, in 46° 45′ N. lat., 50° 02′ 30″ W. lon., at a depth of 44 fathoms; station 2449, in 46° 37′ N. lat., 49° 50′ 30″ W. lon., at a depth of 39 fathoms; station 2506, in 44° 26′ N. lat., 62° 10′ W. lon., at a depth of 127 fathoms; station 2522, in 42° 20′ N. lat., 65° 07′ 30″ W. lon., at a depth of 104 fathoms; station 2490, in 45° 27′ 30″ N. lat., 58° 27′ 45″ W. lon., at a depth of 50 fathoms; station 2466, in 45° 29′ N. lat., 55° 24′ W. lon., at a depth of 67 fathoms; station 2520, in 42° 41′ N. lat., 64° 55′ 30″ W. lon., at a depth of 62 fathoms; station 2491, in 45° 24′ 30″ N. lat., 58° 33′ 15″ W. lon., at a depth of 59 fathoms; station 2451, in 46° 58′ N. lat., 60° 34′ W. lon., at a depth of 67 fathoms; station 2477, in 44° 29′ 30″ N. lat., 57° 11′ 15″ W. lon., at a depth of 114 fathoms; station 2486, in 44° 26′ N. lat., 57° 11′ 15″ W. lon., at a depth of 190 fathoms; No. 33476, U. S. N. M., from station 2068 in 42° 03′ N. lat., 65° 48′ 40″ W. lon., at a depth of 131 fathoms; and No. 33420, U. S. N. M., from station 2062, in 42° 17′ N. lat., 66° 37′ 15″ W. lon., at a depth of 150 fathoms.

ICELINUS, Jordan.

Icelinus, JORDAN, Cat. Fish. N. Amer., 1887, 111, note.—GILBERT, Proc. U. S. Nat Mus., XIII, 1890, 84 (with key to species of *Icelinus*).

Cottids, with body slender, fusiform, having lateral line with a series of spinous plates, above which along the back is a double series of spinous plates placed at an angle; the upper plates with free edge downward and backward, the lower plates with free edge upward and backward, the skin otherwise perfectly smooth. Top of head uneven; interorbital area concave. Head without developed scales. Upper preopercular spine long, with 5 hooked processes.

The type of the genus is *Artedius quadriseriatus*, Lockington. The type species is not found in very deep water, but four other species have recently been described by Gilbert from the coast of California, taken by the *Albatross* between 100 and 150 fathoms.

TRIGLOPS, Reinhardt.

Triglops, REINHARDT, Vid. Selsk. Natur. och Math. Afh., V, lii.—KRÖYER, Nat. Tid., I, 1844, 260.—GÜNTHER, Cat. Fish. Brit. Mus., II, 173.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 712.

Cottids with body rather elongate, with slender tail. Head moderate, rather compressed, prickly, but without scales. Mouth moderate; villiform teeth on jaws and vomer, none on the palatines. Preopercular spines small, simple. Rows of plate-like bones along lateral line and at base of dorsal fin; the space between these densely prickly. Lower half of body crossed at short intervals by transverse undulating folds of skin, the edge of the fold with minute rough scales, causing it to appear sharply and finely serrate. Gill membranes united, free from isthmus. Dorsal spines rather high and slender; ventrals apparently I, 3.

TRIGLOPS PINGELII, REINHARDT. (Figure 256.)

Triglops Pingelii, REINHARDT, Vid. Selsk. Natur. och Math. Afhandl., 1838, 114-118.—GÜNTHER, Cat. Fish. Brit. Mus., II, 173; Proc. Zoöl. Soc. London, 1877, 475; Challenger Report, XXII, 1887, 63.—COLLETT, Norges Fisk., 36; Norsk. Nordh. Exped. Fisk., 38, Pl. I, Figs. 9, 10.—LILLJEBORG, Sverig. och Norg. Fisk., 168.—GOODE & BEAN, Bull. Essex Inst., 1879.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 715.
Triglops pleurostictus, COPE, Proc. Acad. Nat. Sci. Phila., 1865, 81.

Head very slender, its length 3½ in that of body. Eye large, placed high, but lateral; its diameter one-third the length of head, longer than snout, and 3 times width of interorbital space. Preopercular spines 4, short. Maxillary extending to below middle of orbit. Nasal spines sharp. Ventral fins rather short; pectorals extending to front of anal. Tail very slender, its diameter less than the eye. Anal papilla of male large.

Radial formula: D. IX, 21; A. 21.

Color olivaceous, somewhat variegated with darker; fins barred; a series of dusky spots along sides; an ocellated black spot on posterior part of spinous dorsal.

An Arctic species, found off Greenland, Nova Zembla, Norway, and extending in the Western Atlantic southward to the latitudes of New England.

Specimens were taken on the American coast by the steamer *Albatross* from the following localities: Station 2466, in 45° 29′ N. lat., 55° 24′ W. lon., at a depth of 67 fathoms; station 2446, in 46° 20′ N. lat., 49° 52′ W. lon., at a depth of 40 fathoms; station 2501, in 44° 27′ N. lat., 60° 20′ 15″ W. lon., at a depth of 26 fathoms; station 2440, in 43° 38′ N. lat., 49° 49′ 30″ W. lon., at a depth of 33 fathoms; station 2492, in 45° 22′ N. lat., 58° 43′ 45″ W. lon., at a depth of 75 fathoms; station 2449, in 46° 37′ N. lat., 49° 50′ 30″ W. lon., at a depth of 39 fathoms; station 2438, in 43° 36′ N. lat., 50° 03′ 30″ W. lon., at a depth of 37 fathoms; station 2441, in 45° 27′ N. lat., 49° 42′ W. lon., at a depth of 34 fathoms; station 2445, in 46° 09′ 30″ N. lat., 49° 48′ 30″ W. lon., at a depth of 39 fathoms; station 2444, in 45° 59′ N. lat., 49° 45′ 30″ W. lon., at a depth of 39 fathoms; station 2520, in 42° 41′ N. lat., 64° 55′ 30″ W. lon., at a depth of 62 fathoms; station 2058, in 41° 57′ 30″ N. lat., 67° 58′ W. lon., at a depth of 35 fathoms; station 2451, in 46° 58′ N. lat., 50° 34′ W. lon., at a depth of 67 fathoms; station 2450, in 46° 45′ N. lat., 50° 02′ 30″ W. lon.; at a depth of 44 fathoms.

COTTUNCULUS, Collett.

Cottunculus, COLLETT, Norges Fiske, 1875, 20 (type, *Cottunculus microps*, Collett).—JORDAN and GILLBERT, Bull. XVI, U. S. Nat. Mus., 687.—GÜNTHER, Challenger Report, XXII, 1887, 60.

Tadpole-shaped, the head extremely large, the body tapering from shoulders to the slender tail; mouth rather large, terminal, oblique; villiform teeth in the jaws; a double patch on vomer; no teeth on the palatines; no spines on the head, the tubercular surface of the skull covered by skin; skull thin, its bones not firm. Gills 3½, no slit behind the last arch; gill-membranes broadly joined to the isthmus, their union extending to above the lower edge of the base of the pectorals. Pseudobranchiæ very small; no cirri, scales, or prickles; the skin thin and movable, smooth, or roughened with small warts. Spinous dorsal little developed; the two fins usually continuous; spines very slender, flexible, embedded in the skin; pectorals short, procurrent below; ventrals very short, well separated, their rays I, 3; caudal rounded. (*Jordan and Gilbert.*)

COTTUNCULUS MICROPS, COLLETT. (Figures 257 and 261, A, B.)

Cottunculus microps, COLLETT, Norges Fiske, 1875, 20, pl. I, figs. 1-3; Meddelelser om Norges Fiske, Aarena, 1875-'78, 1879, 11; Forh. Vid. Selsk., Christiania, 1880, 11; Norsk. Nordh. Exped., 18, pl. I, figs. 5, 6; Nyt. Mag. f. Naturvid., XVIII, 1884, 53.—STRÖM, Norsk. Vid. Selsk. Skrift., 1880, 75.—GOODE, Proc. U. S. Nat. Mus., 1880, 479.—GOODE and BEAN, Bull. Mus. Comp. Zool., X, 1883, 212.—LILLJEBORG, Sverig. och Norg. Fiske, 113.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 689 (description quoted below from full-grown specimens).—GÜNTHER, Challenger Report, XXII, 1887, 60, pl. IX, fig. A.

Head very large, its length, breadth, and depth nearly equal; the greatest depth at the nape; four bony tubercles on top of head and some at the sides, all covered by the skin; lower jaw included; maxillary extending to below the middle of the eye, which is equal to the snout, and about 4½ in head; suborbital stay and the roughish edge of the preopercle both covered by smooth skin; chin and preorbital with pores. Skin everywhere thin, somewhat movable, its surface roughened by small, blunt warts. Dorsal fin continous, the feeble spines lower than the soft rays; pectorals barely reaching anal; caudal long. Head 2⅔; depth 3½. (*Jordan and Gilbert.*)

Radial formula: D. VI, 19; A. 10.

Color, pale, with three broad, dusky cross bands on body and fins, one on head, one through spinous dorsal and pectoral, one through second dorsal and anal, besides a small band at base of caudal.

This species was first described from a specimen measuring 15 millimeters, dredged by Prof. G. O. Sars at Hasvig, near Hammerfest, in 200 fathoms, August, 1874; another, 50 millimeters long, near Trondhjemsfjord, in 1878, by Mr. Ström, at a depth of 180 fathoms; again, at a depth of 191 fathoms, 18 miles northwest from Hammerfest (72° 27′ N., 20° 51′ W.), in temperature 3° .5 C., and at a depth of 459 fathoms; 15 miles westward of northwestern Spitzbergen (79° 59′ N., 5° 40′ W.), with temperature of 1° C.

The *Blake* secured a specimen of this species from station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; and two examples from station CCCX, in 39° 59′ 16″ N. lat., 70° 18′ 30″ W. lon., at a depth of 260 fathoms.

Specimens were taken by the *Fish Hawk* as follows: No. 26087, U. S. N. M., from station 880, in 38° 48′ 30″ N. lat., 70° 54′ W. lon., at a depth of 252½ fathoms; No. 31760, U. S. N. M., from station 1142, in 39° 32′ N. lat., 72° 00′ W. lon., at a depth of 322 fathoms; No. 28728, U. S. N. M., from station 925, in 39° 55′ N. lat., 70° 47′ W. lon., at a depth of 229 fathoms; No. 28798, U. S. N. M., from station 947, in 30° 53′ 30″ N. lat., 71° 13′ 30″ W. lon., at a depth of 319 fathoms; No. 28771, U. S. N. M., from station 938, in 39° 51′ N. lat., 69° 49′ 15″ W. lon., at a depth of 317 fathoms; No. 28814, U. S. N. M., from station 946, in 39° 55′ 30″ N. lat., 71° 14′ W. lon., at a depth of 247 fathoms; No. 29077, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; No. 28936, U. S. N. M., from station 1031, in 39° 57′ N. lat., 69° 19′ W. lon., at a depth of 255 fathoms; No. 28922, U. S. N. M., from station 998, in 39° 43′ N. lat., 71° 32′ W. lon., at a depth of 302 fathoms; No. 26176, U. S. N. M., from station 895, in 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., at a depth of 238 fathoms; No. 26167, U. S. N. M., from station 892, in 39° 46′ N. lat., 71° 05′ W. lon., at a depth of 487 fathoms; and also from station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms.

Additional specimens were obtained by the *Albatross* as follows: No. 33310, U. S. N. M., from station 2028, in 39° 57′ 50″ N. lat., 70° 32′ W. lon., at a depth of 209 fathoms; No. 33465, U. S. N. M., from station 2063, in 42° 23′ N. lat., 66° 23′ W. lon., at a depth of 141 fathoms; No. 33514, U. S. N. M., from station 2092, in 39° 58′ 35″ N. lat., 71° 00′ 30″ W. lon., at a depth of 197 fathoms; No. 33479, U. S. N. M., from station, in 42° 15′ 25″ N. lat., 65° 48′ 40″ W. lon., at a depth of 122 fathoms; and No. 35461, U. S. N. M., from station 2187, in 39° 49′ 30″ N. lat., 71° 10′ W. lon., at a depth of 420 fathoms.

COTTUNCULUS THOMSONII, GÜNTHER. (Figures 258, 262 A, B.)

Cottus Thomsonii, GÜNTHER, Proc. Royal Soc., Edinburgh, XI, 1882, 679.

Cottunculus Thomsonii, GÜNTHER, Challenger Report, XXII, 1887, 61, pl. IX, fig. B.

Cottunculus torvus, GOODE, Proc. U. S. Nat. Mus., III, 1880, 479; Bull. Mus. Comp. Zool., X, 1883, 212, 213.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 688.

Head and body smooth, scaleless, covered with a tough, lax skin. The length of the head is nearly one-third of the extreme length of the body, including the caudal; its greatest height, one fourth of the body without the caudal. The greatest width of the head is twice the length of the maxilla. The distance of the vent from the insertion of the anal equals the length of the maxilla. The eye is close to the dorsal profile. The length of the orbit is about equal to that of the snout, and is contained about 4½ times in the greatest length of the head. The intermaxillary is long and slender, its length contained slightly more than 3 times in the distance from the tip of the snout to the insertion of the first dorsal (3⅓ times in the length of the head). The maxilla is very slender, except in its posterior third, where it is considerably expanded. The mandible is very stout, posteriorly widened, its length contained nearly 2⅓ times in that of the head. Teeth in broad villiform bands on the intermaxillary and the mandible. Two short, separate, similar bands on the vomer. None on the palatines.

Head armed with blunt spines, as in *C. microps*.

The distance of the dorsal from the tip of the snout is nearly equal to one-third of the total length, caudal included. It consists of 6 spines and 17 rays.

The anal fin is located midway between the tip of the snout and the end of the caudal fin; it consists of 13 rays.

The length of the upper pectoral rays is equal to that of the postorbital portion of the head. The pectoral rays diminish rapidly in size, the lowest being exceedingly short. The number of rays is 22. The distance of the ventral from the tip of the snout is one-third of the total length without the caudal. The length of the free portion of the ventral equals that of the eye. The fin consists of 1 spine and 3 rays.

The caudal consists of 10 developed rays.

Color light brown, the fins somewhat darker.

Specimens were obtained by the *Blake* from station CCCVI, in 41° 32′ 50″ N. lat., 65° 55′ W. lon., at a depth of 524 fathoms; station CCCXLIII, in 39° 45′ 50″ N. lat., 70° 55′ W. lon., at a depth of 732 fathoms; and station CCCXXVI, in 33° 42′ 15″ N. lat., 76° 00′ 50″ W. lon., at a depth of 464 fathoms.

Also by the *Albatross* from the following localities: No. 35405, U. S. N. M., from station 2181, in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms; No. 35547, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; No. 35404, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; No. 35605, U. S. N. M., from station 2213, in 39° 58′ 30″ N. lat., 70° 30′ W. lon., at a depth of 384 fathoms; No. 35483, U. S. N. M., from station 2186, in 39° 52′ 15″ N. lat., 70° 55′ 30″ W. lon., at a depth of 353 fathoms; No. 35489, U. S. N. M., from station 2189, in 39° 49′ 30″ N. lat., 70° 26′ W. lon., at a depth of 600 fathoms; No. 35423, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; No. 33390, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; No. 32676, U. S. N. M., from station 2004, in 37° 19′ 45″ N. lat., 74° 26′ 06″ W. lon., at a depth of 105 fathoms; and from station 2552, in 39° 47′ 07″ N. lat., 70° 35′ W. lon., at a depth of 721 fathoms; station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; station 2115, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., at a depth of 843 fathoms; station 2529, in 41° 03′ 30″ N. lat., 66° 14′ W. lon., at a depth of 662 fathoms; and station 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., at a depth of 677 fathoms.

Additional specimens were secured by the *Fish Hawk* as follows: No. 28951, U. S. N. M., from station 1029, in 39° 57′ 06″ N. lat., 69° 16′ W. lon,, at a depth of 458 fathoms; No. 30276, U. S. N. M., from station 998, in 39° 43′ N. lat., 71° 32′ W. lon., at a depth of 302 fathoms; No. 26140, U. S. N. M., off Newport, R. I.; No. 29075, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; No. 28850, U. S. N. M., from station 952, in 39° 55′ N. lat., 70° 28′ W. lon., at a depth of 225 fathoms; No. 28888, U. S. N. M., from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; No. 28916, U. S. N. M., from station 994; and an individual from station 892, in 39° 46′ N. lat., 71° 05′ W. lon., at a depth of 487 fathoms.

MALACOCOTTUS, Bean.

Malacocottus, BEAN, Proc. U. S. Nat. Mus., XIII, 1890, 42.

Shape similar to that of *Cottunculus*. Head large; body tapering rapidly to the slender tail; mouth terminal; jaws subequal. Minute villiform teeth in broad bands on maxilla and mandible; vomer and palate toothless. Preoperculum armed with short, stout, simple spines. Bones of the skull thin. Gills 3½; no slit behind the last. Gill openings wide; the membranes broadly attached to the isthmus. Gill-rakers tubercular, in moderate number. Spinous dorsal low, separated by a deep notch from the soft dorsal. Pectorals procurrent in front. Ventrals small; caudal rounded. Vent distant from the anal origin. Head and body naked. Lateral line consisting of a series of large pores.

This genus is represented by seven examples of the type species, *M. zonurus*, Bean, taken by the *Albatross* on August 9, 1888, from station 2853, off Trinity Islands, in 56° N. lat., 154° W. lon., at a depth of 159 fathoms.

Family CYCLOPTERIDÆ.

Cyclopteridæ, Bonaparte, Cat. Metodico, 1846, 64.—Gill, Arr. Families of Fishes, 1872, xxx; Century Dictionary, 1424.—Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 744.—Gill, Proc. U. S. Nat. Mus., xiii, 366, 1891.

Cyclopterina, Günther, Cat. Fish. Brit. Mus., iii, 154.

Cyclopteroidea, with a feebly ossified skeleton and ventricose body, covered with thick skin, which may be either smooth, tubercular, or spinous. Head short, thick; suborbital stay present, thin and flattish. Mouth small, terminal; jaws lateral, with slender teeth in bands; vomer and palatines toothless. Gill openings narrow, membranes broadly joined to isthmus and shoulder girdle. Branchiostegals 6. Dorsal fin long, its anterior portion of flexible spines, sometimes hidden in adult by a fleshy hump, sometimes wanting. Soft dorsal small, opposite and similar to anal. Caudal rounded. Ventral rudimentary, forming the bony center of a thoracic sucking disk. Pectorals short, low, with bases broad and procurrent. Pyloric cæca numerous. Vertebræ 12+16.

KEY TO THE GENERA OF CYCLOPTERIDÆ.

(From Jordan and Gilbert, rearranged.)

I. Spinous dorsal present, sometimes disappearing with age; skin tuberculate.
  A. Dorsal spines in adult hidden in a fleshy hump. Ventral disk small..................CYCLOPTERUS
  B. Dorsal spines not hidden in adult; gill opening a small slit; ventral disk large....EUMICROTREMUS
II. Spinous dorsal wanting; skin smooth or nearly so..............................[CYCLOPTERICHTHYS]

Genus EUMICROTREMUS, Gill.

Eumicrotremus, Gill, Proc. Acad. Nat. Sci., Phila., 1864, 190.—Collett, Norsk. Nordh. Exp., 67.—Goode and Bean, Bull. Essex Inst. xi, 12.—Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 957.

Cyclopterids with a spinous dorsal, which is sometimes in adults hidden in the skin, though never disappearing with age. Skin thick, armed with series of bony tubercles. Gill opening a small slit on level of eye. Ventral disk large.

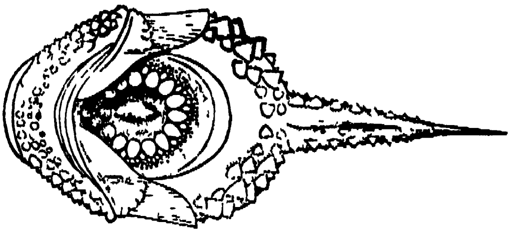
EUMICROTREMUS SPINOSUS, (Müller), Gill. (Figure 250.)

Cyclopterus spinosus, Müller, Prodromus Zoologiæ Danicæ, 1777, ix.—Gaimard, Voy. Skand., Poiss., pl. iv, fig. 2—Günther, Cat. Fish. Brit. Mus., iii, 1861, 157; Proc. Zoöl. Soc., London, 1877, 293, fig. (young); *ibid.*, 475; Challenger Report, xxii, 1887, 66.—Malmgren, Ofvers. K. Vet. Ak. Forh., 1864, 489, sp. 6.—Frisch, Peterm. Geogr. Mitth. 1865, Erg. Heft. Nr. 16, 35.—Heuglin, Fauna and Flora in Geologie Spitzbergen in Novaja Semlja, 1874, 211.—Jordan and Gilbert, Bull. xvi, U. S. N. M., 746.

Lumpus spinosus, Storer, Syn. Fish. N. A., 1846, 230.

Eumicrotremus spinosus, Gill, Proc. Acad. Nat. Sci., Phila., 1864, 190.—Collett, Norske Nordh. Exped., Fisk., 67, pl. ii, fig. 13.—Goode and Bean, Bull. Essex Inst., xi, 12.—Jordan and Gilbert, Bull. xvi, U. S. N. M., 957.—Jordan, Cat. Fish. N. A., 116.

Body orbicular, cuboid anteriorly, its height nearly one-half of its length, which is 3 times the length of the head; base of spinous dorsal and body behind vent abruptly compressed; teeth in narrow bands; gill openings on a level with eye, slightly narrower than orbit. Spinous dorsal not hidden, covered with rough tubercles, similar to those on body, but smaller; width of ventral disk slightly less than its length, and somewhat less than length of head. Body covered with irregular, roundish, conical plates, varying much in size, some of the larger with a central point, turned backward; all the plates with small tubercles and slender flexible prickles; small plates along bases of all the fins; a series of 6 large plates extending backward from above eye to opposite the interval between dorsals; a series of 5 on each side of middle of interocular space from snout to nape, these increasing much in size posteriorly; a series of 3 along opercular margin; along base of spinous dorsal a series of 4, not connected with that of interorbital space; a single large plate on each side of the interval between dorsals; two longitudinal series of 4 large plates each, beginning above base of pectorals and behind gill slits, terminating under the space between dorsals; the largest plate on body is immediately behind axil of pectoral; a smaller one below it, and two others between it and origin of anal; two series of smaller plates below eye; many small plates interposed between the series of large ones; very small plates on under side of head and middle of tail; no plates between ventral disk and vent; none in axil of pectorals.



Radial formula: D. VII, 11; A. 10; C. 10.

Color, olivaceous, the skin between the plates thickly punctate. (*Jordan and Gilbert*, from an Alaska specimen.)

One specimen was dredged by the U. S. Fish Commission 6 miles off Half Way Rock, Salem, Mass., August 10, 1877, in 35 fathoms. Two specimens were dredged in 1861 by Prof. Verrill, off Anticosti in 10 fathoms, and another was taken by the U. S. Fish Commission at Eastport, Me., in 1872.

It was also obtained by the *Albatross* from station 2456, in 47° 29′ N. lat., 52° 18′ W. lon., at a depth of 86 fathoms; from station 2450, in 46° 45′ N. lat., 50° 02′ 30″ W. lon., at a depth of 44 fathoms; and from station 2445, in 46° 09′ 30″ N. lat., 49° 48′ 30″ W. lon., at a depth of 39 fathoms.

Collett's specimens were from the northeastern Atlantic and from a depth of 120 fathoms.

Family LIPARIDIDÆ.

Family *Discoboli*, group *Liparidina*, GÜNTHER, Cat. Fish. Brit. Mus., III, 1861, 154.

Liparididæ, GILL, Arr. Families of Fishes, 1872, 5 (No. 48); Century Dictionary, 3471.—JORDAN and GILBERT, Bull., XVI, U. S. Nat. Mus., 738 (full description).—GILL, Proc. U. S. Nat. Mus., XIII, 370, 1891.—GARMAN, Discoboli, 1892, 43.

Body anteriorly broad, rounded, somewhat depressed, compressed behind, covered with smooth skin, which is usually very lax. Head obtuse, broad, the snout wide and blunt; suborbital bone styliform behind, joined to the opercle, as in the Cottoids. Mouth terminal. Jaws with villiform bands of small teeth, tricuspid to simple; no teeth on vomer or palatines. Premaxillaries protractile, little movable. Opercular bones unarmed; interopercle slender, ray-like, overlying the branchiostegals. Gill-openings small, above base of pectoral, with membranes joined to the broad isthmus, and to the humeral arch below. Gills 3½, no slit behind the last. Pseudobranchiæ rudimentary or wanting. Pyloric cæca numerous. No air-bladder. Dorsal fin long, with feeble and flexible spines, similar to the soft rays. Anal long, similar to the soft dorsal. Ventrals, when present, completely united, and forming the bony center of an oval sucking-disk, but sometimes entirely wanting. Pectorals very broad, the base extending forward under throat; the outline usually emarginate, some of the lower rays being produced; tail diphycercal. Caudal elongate, distinct or confluent with dorsal and anal. Stomach siphonal, and intestine elongate.

KEY TO THE GENERA OF LIPARIDIDÆ.

1. Ventral disk present .... LIPARIDINÆ
   - A. Caudal more or less distinct. Teeth tricuspid. Pseudobranchiæ.
     1. Vertebræ less than 40. A strong curved frontal ridge, convex in front, crossing interorbital space .... LIPARIS
     2. Vertebræ more than 45. Frontal regions broader, and without prominent transverse ridge. .... [CARELIPARIS]
   - B. Caudal indistinct, tenuous. Teeth simple (in adults).
     1. Skull higher than in *Liparis*; frontal ridge moderate .... CAREPROCTUS
2. Ventral disk absent .... AMITRINÆ
   - A. Pseudobranchiæ present.
     1. Pectoral simple, with (six) lowest rays prolonged .... AMITRA
   - B. Pseudobranchiæ absent.
     1. Pectoral in two distinct lobes .... PARALIPARIS
     2. Pectoral fringed posteriorly, and with (eight) lowest rays free, but not forming distinct lobe.. .... HILGENDORFIA

LIPARIS, Artedi.

Liparis, Artedi, Synonimia Piscium, 1788, p. 117.—Scopoli, Introductio, 1777.—Cuvier, Règne Animal, ed. I, 1817, p. 227.—Günther, Cat. Fish. Brit. Mus., III, p. 158.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., p. 738.—Garman, Discoboli, 1892, 45.

Neoliparis, Steindachner, Ichth. Beitrage, III, 1875, 54 (type, *L. mucosus*).

Body tadpole-shaped, subcylindrical anteriorly, compressed and tapering posteriorly, enveloped in smooth skin, usually somewhat loose. Head short, broad; snout short, blunt; mouth horizontal, with lower jaw included. Teeth numerous, in cardiform bands; usually tricuspid on intermaxillaries and mandible, simple on pharyngeals. Dorsal and anal fins with rays feeble, flexible, those anterior scarcely differentiated; more or less confluent with caudal. Pectorals broad, emarginate, procurrent under throat, some of the lower rays produced. Ventrals transformable into a well-developed disk on the breast, its front below or behind the middle of the head, about midway between sucking-disk and anal fin. Pseudobranchiæ present.

LIPARIS LINEATUS, (Lepechin), Kröyer.

Cyclopterus liparis, Linnæus, Syst. Nat., ed. XII, 1766, I, 414.

Liparis liparis, Cuvier, Règne Animal, ed. I, 1817, II, 227.—Günther, Chall. Rep., XXII, 1887, 67.—Garman, Discoboli, 57.

Cyclopterus lineatus, Lepechin, Nov. Com. Petropol., XVIII, 1773, 522, pl. V, figs. 2, 3.

Liparis lineatus, Kröyer, Nat. Tidsskr., II, 1847, 284.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 742.—Collett, Norges Fiske, 1875, 65.

Liparis vulgaris, Fleming, Phil. Zoöl., 1822, 387; British Animals, 1828, 190.—Günther, Cat. Fish. Brit. Mus., III, 159.—Kröyer, Nat. Foren. Vid. Med., 1860-61, 243.—Collett, Norges Fiske, 1875, 65.—Goode and Bean, Bull. Essex Inst., XI, 1879, 11.

Liparis barbatus, Ekström, Vet. Akad. Handl., 1832, 168, pl. v.

Liparis stellatus, Malm, For. Sk. Nat., 1865, 412.

Liparis Ekströmi, Malm, *loc. cit.*

Body thick, covered with thin loose skin, its height two-sevenths of its length; head obtuse, with swollen nape, its length one-fourth that of the body; snout broad, not depressed; lips thickish; posterior nostril tubular. Diameter of orbit one-seventh length of head. Gill-openings vertical slits surpassing root of pectoral; no pseudobranchiæ. Tail truncate at base of caudal. Dorsal and anal confluent with caudal. Ventral disk rather longer than broad, half length of head, its margin with about 13 papillæ.

Radial formula: D. 33; A. 28.

Color, yellowish, striped with dark brown or purplish; the color very variable.

Günther records the capture of a specimen, probably of this species, from the cruise of the *Porcupine*, in 180 fathoms, north of Shetland. The form to which he refers is doubtless that known to American students as *L. lineata*.

This species was often taken by the Fish Commission vessels off the south coast of New England, in 30 to 60 fathoms, parasitic in the shell of a large scallop, *Pecten tenuicostatus*, in company often with a crab of the genus *Pinnotheres*, closely related to the "oyster-crab."

CAREPROCTUS, Kröyer.

Careproctus, Kröyer, Naturh. Tidsskr., I, 257, 1862 (type, *Liparis Reinhardti*, Kröyer).—Garman, Discoboli, 1892, 72.

Liparidoids with body elongate, covered with thin lax skin, translucent. Mouth oblique, with projecting lower jaw. Teeth simple, hooked (tricuspid in young). Ventral disk small, under head, the vent a little behind ventral disk, but far in front of anal fin.

Garman shows that the head of *Careproctus* is higher posteriorly than in *Liparis*; the body deeper in front of the dorsal fin; the caudal region longer, slenderer, more tapering; the dorsal and anal having more rays, and more completely joined with caudal; the ventral disk reduced in size; and the suborbital process less developed.

CAREPROCTUS GELATINOSUS, (Pallas), Kröyer.

Cyclopterus gelatinosus, Pallas, Spicilegia Zoölogica, VII, 1769, 19, pl. III, fig. 1.

Liparis gelatinosus, Cuvier, Règne Animal, ed. 1, 1817, II, 227.—Günther, Cat. Fish. Brit. Mus., III, 163; Challenger Report, XXII, 1887, 57.—Reinhardt, Oversigt, etc., 1844, lxxvii.

Careproctus gelatinosus, Kröyer, *loc. cit.*—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 740.—Garman, Discoboli, 76.

Liparis Reinhardti, Kröyer, Naturh. Tidsskr., I, 252.

Careproctus Reinhardti, Kröyer, Naturh. Tidsskr., I, 1862, 252.—Collett, Norsk. Nordh. Exp., Fiske, 57, pl. II, figs. 15, 16.

Ventral disk very small, supported by a bilamellate cartilage descending from the throat; vertical fins continuous. Body oblong, compressed, semitransparent, soft, and gelatinous; head thick, flat above; cleft of mouth nearly vertical, as in *Uranoscopus*; a series of pores along upper lip; jaws, palate, and pharynx rough with teeth; skeleton very weak.

Radial formula: D. 50; A. about 45; C. 6; P. 30. Cæca 48. Vertebræ 64.

Rose-colored with vertical fins violet; gill cavity black. (*Günther.*)

An Arctic circumpolar species, first described from the North Pacific (Bering Strait), afterwards found on the Greenland coast, and recently discovered by the North Atlantic Expedition about Jan Mayen and Bear Island, and off Arendal, at depths varying between 263 and 658 fathoms; also found in the Kara Sea.

Careproctus spéctrum, Bean, from Alaska (Proc. U. S. Nat. Mus., XIII, 40), is an allied form.

CAREPROCTUS RANULA, Goode and Bean. (Figures 251 and 251 A, B.)

Liparis ranula, Goode and Bean, Proc. U. S. Nat. Mus., II, 1879, 46.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 742.

A species with body thick, subcylindrical anteriorly, rapidly tapering to the tail, covered with a thick lax integument; its greatest height (.25) equals the length of the head and is one-fourth of the total length of the body without caudal.

Head somewhat tumescent at the nape; its height (over the ventral disk and eyes) contained something over six times in the length of the body; its greatest width (.18) very slightly greater and equaling twice the width of the ventral disk. Snout broad, with prominent vertical profile; its length about one-fourth that of the head. Cleft of the mouth horizontal, not extending to perpendicular from the anterior margin of the orbit. Lips covered with thick lax skin, the upper jaw extending beyond the lower.

Length of the upper jaw about one-third of length of head; that of mandible slightly greater than length of ventral disk. Each jaw armed with a band of villiform teeth; tongue thick, obtuse. Eye is lateral, not interfering with the upper profile of the head; its diameter (.07) more than one-fourth of the length of the head, and contained about fourteen times in the length of the body. Width of interorbital area is contained 2½ times in length of head. Nostril close to eye. Gill opening a vertical slit, extending upon upper part of root of the pectoral.

Dorsal is inserted at a distance from snout equal to one-third of length of body. It contains about 48 rays (though to count them is almost impossible). Anal originates at a distance from snout equal to two-fifths of length of body, and in perpendicular from eighth dorsal ray; it contains at least 48 rays. Pectoral moderately broad, with 15 long rays and 12 or 13 shorter ones; the long rays are twice as long as the ventral disk and extend nearly or quite to perpendicular from vent.

Ventral disk slightly longer (.10) than its distance from snout (.09), which precisely equals its width; it has 14 papillæ.

Color is uniform whitish, almost colorless, and translucent in life.

This species was taken in the large trawl net by the collecting party on the United States steamer *Speedwell*, September 24, 1877, off the mouth of Halifax Harbor (station 117, 8½ miles southeast from Chebucto Head). The depth at which it was found was 52 fathoms, the temperature at the bottom 35° F. The bottom was of fine sand and mud, and in the same haul of the net were taken the following species: *Glyptocephalus cynoglossus*, *Hippoglossoides platessoides*, *Sebastes marinus* (young), *Phycis chuss*, *Aspidophoroides monopterygius*, *Triglops Pingelii*, *Centridermichthys unciñatus*, and *Raia radiata*.

Specimens of this species were also taken by the *Albatross* from station 2455, in 47° 21′ N. lat.; 51° 38′ 30″ W. lon., at a depth of 81 fathoms.

The species resembles, in the shape of its head, the *Liparis Fabricii* of Kröyer, but is easily distinguished by its less elongate body and the greater number of rays in the dorsal and anal fins. When first taken it was colorless, almost translucent, and was covered with a thick tough integument. The preceding description is less complete than would seem desirable, owing to the fact that the type specimen (No. 22310, U. S. Nat. Mus. Cat.) was too soft and tender to admit of the requisite manipulation. The specimen, which is 56 millimeters in total length (caudal included), is a mature female, having in the abdominal cavity many large eggs.

TABLE OF MEASUREMENTS.

Current number of specimen Locality	22310. Station 117, off Halifax.	
	Millimeters.	100ths of lengths.
Length to origin of middle caudal rays	52	
Body:		
Greatest height		25
Height at ventral disk		17
Head:		
Greatest length		25
Greatest width		18
Width of interorbital area		10
Length of snout		6
Length of upper jaw		8
Length of mandible		11
Diameter of orbit		7
Dorsal:		
Distance from snout		32
Anal:		
Distance from snout		40
Caudal:		
Length of middle rays		(8)
Pectoral:		
Distance from snout		23
Length		20
Ventral:		
Distance of disk from snout		9
Length of disk		10
Width of disk		9
Dorsal	48	
Anal	(48)	
Pectoral	15+12 or 13	
Ventral (number of papillæ in disk)	14	

CAREPROCTUS MAJOR, (FABRICIUS), GARMAN.

Cyclopterus liparis, var. *major*, FABRICIUS, Fauna Grœnlandica, 1780, 136.—WALBAUM, Art. Gen. Pisc., 1792, 489.—Var. *b*, *Amersulak*, BONNAT., Tabl. Encycl., 1788, 28.

Liparis major, GILL, Proc. Acad. Nat. Sci. Phila., 1864, 193.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1882, 741.

Actinochir major, GILL, Cat. Fish. E. C. N. A., 1873, 21.

Liparis (*Actinochir*) *major*, JORDAN, Rep. U. S. Fish Comm., 1885 (1887), 903.

Liparis tunicata, KRÖYER, Nat. Tidsskr. (3), I, pt. 2, 1862, 236. GILL, Proc. Acad. Nat. Sci. Phila., 1864, 190.—COLLETT, Norsk. Nord-Havs. Exp., Fiske, 1880, 59.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1882, 742.

Actinochir tunicata, GILL, Proc. Acad. Nat. Sci. Phila., 1861, 190.

Liparis Fabricii, LÜTKEN, Kara-Havets Fisk., 1887, 146, pl. XV, figs. 4-6.—GILL, Proc. U. S. Nat, Mus., XIII, 1891, pl. XXIX (from Lütken).

Careproctus major, GARMAN, Discoboli, 1892.

Diameter of eye contained nearly 3 times in snout or interorbital space. Posterior nostril not tubular. Pseudobranchiæ reduced to 2 lamellæ. Vertical fins continuous; anal beginning below tenth dorsal ray. Ventral disk longer than broad, half length of head. Skin thin, loose.

Radial formula: D. 42; A. 34; C. 12; P. 34.

Color, yellowish, mottled with brownish.

Lütken states that he received a great number of specimens of this Arctic species from the Kara Sea, where they were obtained at depths varying from 46 to 106 fathoms.

This form is provisionally placed in *Careproctus*, but we are quite prepared to believe that Gill's *Actinochir* is a valid genus. The fish has a close external resemblance to the species of *Liparis*.

CAREPROCTUS MICROPUS, (GÜNTHER), GARMAN.

Liparis micropus, GÜNTHER, Challenger Report, XXII, 1887, 66, pl. XII, fig. B.

Careproctus micropus, GARMAN, Discoboli, 1892, 72.

Head large and thick, about one-fourth of the total length, the caudal included. The interorbital space equals in length the postorbital portion of the head. Eye entirely in the anterior half of the head and one-fifth of its length. Nostrils not tubular. Cleft of the mouth not extending to the front margin of the eye. Teeth simple, unicuspid.

Vertical fins continuous, caudal very narrow and pointed. The origin of the anal is opposite to the eighth dorsal ray. Form of the pectoral typical, the foremost rays being opposite to the anterior margin of the ventral disc. Ventral disc circular, small, one-fourth of the length of the head, situated immediately behind the level of the eye. Vent very close to ventral disc. Color light grayish or purplish. (*Günther.*)

Two specimens, 2 and 3½ inches long, were obtained by the *Knight Errant* at station 9, from a depth of 608 fathoms; and also a single individual, 3½ inches long, at station 8, in 540 fathoms.

AMITRA, Goode.

Amitra, GOODE, Proc. U. S. N. M., III, sig. 30, 478, Feb. 16, 1881.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 739.

Monomitra, GOODE, Proc. U. S. N. M., VI, 478-9. (July, 1883.)

Liparids with small head and an elongate, attenuate body, covered with thick, lax, slimy skin. Ventral disk absent. Opercular stay present. Pseudobranchiæ present. Gills 3½, without slit behind last. Gill-openings closed below, restricted to small slits under the very small operculum. Operculum very small, strap-shaped. Lower jaw included within the upper. Teeth weak, paved. First five rays of the dorsal non-articulate, the others grading gradually into the flexible rays. Pectoral simple, with lowest rays prolonged.

AMITRA LIPARINA, GOODE. (Figure 252.)

Amitra liparina, GOODE, Proc. U. S. N. M., III, 478, Feb. 16, 1881.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 739.

Monomitra liparina, GOODE, Proc. U. S. N. M., VI, 1889. 109.—BEAN, Rep. U. S. F. C., 1882 (1884) 341.—JORDAN, Rep. U. S. F. C., 1885 (1887), 903.

Paraliparis liparinus, GÜNTHER, Challenger Report, XXII, 1887, 62.—GARMAN, Discoboli, 82.

Body elongate, compressed posteriorly, very thin at the tail, covered with a gelatinous, lax, transparent skin, which is separated from the body and the fins by a filmy, mucous intertissue. Greatest height of body (.18) contained 5½ times in its length, without caudal.

Head thick, convex between eyes, its greatest width (.11) nearly three-fourths its length (.15), which is contained 6⅔ times in the length of the body. Snout convex, protruding. Mouth under the snout and far back from its tip. Eyes lateral, in diameter (.03) about half. the width of the interorbital area (.05). Nostril in front of eye. Pores along the upper lip When the head is viewed from directly in front the opening of the mouth seems to be convex upward.

The dorsal fin begins over the end of the pectoral, and the rays and outline of this, as well as of the anal, are hardly visible through the thick, lax skin. The rays are thick, but very flexible. The anal begins under the eighth to tenth dorsal ray. The dorsal and anal rays lie closely connected with those of the caudal, which are somewhat longer, and extend in a pencil-like point.

The pectoral is broad, its lower base almost under the posterior margin of the orbit. It is composed of twenty-three rays, the six lowest of which are prolonged beyond the lower rays, contiguous.

Radial formula: D. 67; A. 54; C. 6; P. 23.

Color, yellowish white, dusky toward the tail and blackish upon the anterior part of the head; abdominal cavity showing black through the skin.

MEASUREMENTS.

Current number of specimen Locality	26184. Station 891.	
	Milli-meters.	100ths of length.
Extreme length	164	....
Length to base of middle caudal rays	150	100
Body:		
Greatest height	....	18
Greatest width	....	9
Head:		
Greatest length	....	15
Greatest width	....	11
Width of interorbital area	....	5
Length of snout	....	4
Diameter of orbit	....	3
Dorsal:		
Distance from snout	....	30
Greatest height	....	6
Anal		
Distance from snout	....	37
Height at longest ray	....	5
Caudal:		
Length of middle rays	....	9
Pectoral:		
Distance from snout (below)	....	8
Length	....	10
Dorsal	....	67
Anal	....	54
Caudal	....	6
Pectoral	....	23

The type specimen (Cat. No. 26184, U. S. N. M.) was taken by the *Fish Hawk* from station 891, in 39° 46′ N. lat., 71° 10′ W. lon., at a depth of 480 (?) fathoms. Additional examples were secured by the same vessel as follows: Cat. No. 28899, U. S. N. M., from station 997, in 39° 42′ N. lat., 71° 32′ W. lon., at a depth of 335 fathoms; Cat. No. 28855, U. S. N. M., from station 952, in 39° 55′ N. lat., 70° 28′ W. lon., at a depth of 396 fathoms; Cat. No.

28786, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; Cat. No. 31758, U. S. N. M., from station 1140, in 39° 34′ N. lat., 71° 56′ W. lon., at a depth of 374 fathoms; Cat. No. 28900, U. S. N. M., from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; and Cat. No. 31594 (?), U. S. N. M., from station 1093, in 39° 56′ N. lat., 69° 45′ W. lon., at a depth of 349 fathoms. Two other specimens of this or a related species (Cat. No. 26179, U. S. N. M.) were obtained by the *Fish Hawk* from station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms, but they are in poor condition, and cannot at present be identified. A single individual was taken by the *Albatross* from station 2561, in 39° 38′ N. lat., 71° 42′ W. lon., at a depth of 500 fathoms; and four examples (Cat. No. 35562, U. S. N. M.) from station 2212, in 39° 59′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 428 fathoms.

PARALIPARIS, Collett.

Paraliparis, COLLETT, Vid. Selsk. Forh. Christiania, 1878, No. 11, 32 (as subgenus).—GÜNTHER, Challenger Report, XXII, 1887, 68. —GARMAN (part) Discoboli, 1892, 80.

Liparids with long, slender, compressed body, attenuate posteriorly, covered with loose thin skin. Ventral disk absent. Pseudobranchiæ absent. Pectoral fin in two portions. Dorsal and anal confluent with caudal. Teeth minute, simple.

PARALIPARIS BATHYBII, COLLETT.

Liparis (Paraliparis) bathybii, COLLETT, Vid. Selsk. Forh. Christiania, 1878, No. 14, 32.
Liparis bathybii, COLLETT, Norske Nordhavs Expeditionen, Fisk., p. 52. pl. II, fig. 15.
Parliparis bathybius, GÜNTHER, Challenger, Report, XXII, 1887, 68, pl. XII, fig. C.—GILL, Proc. U. S. Nat. Mus., XIII, 1891, 373.—GARMAN, Discoboli, 1892, 81.

Head short and globular; equal in length to the depth of the body, and is to total length as 1 to 5½; eyes (orbitæ) large, their longitudinal diameter being to the length of the head as 1 to 3½, and to width of interorbital space about as 1 to 1⅜; the dorsal and anal fins covering two-thirds of the caudal; snout short, but slightly exceeding the diameter of the orbit; the upper and lower divisions of the pectorals are separated by a space furnished with 3 to 4 rudimentary rays. (Concerning the eyes, the ventral disk, and the position of the vent nothing is known.—*Collett.*)

Radial formula: D. 59; A. 51; P. 13 | 3 (4) | 3; C. 8.

Color, brownish-black.

Length of body in the specimen examined (female) 208 millimeters. (*Collett.*)

Collett's type was obtained 108 kilometers west of Bear Island, in 658 fathoms. The *Knight Errant* collected it at station 8, 1882, in 640 fathoms.

PARALIPARIS COPEI, GOODE and BEAN, n. s. (Figure 253.)

This species has nearly the same number of rays in the dorsal and anal as are recorded in *P. bathybius*, but the pectoral has 17 rays in the upper portion and 3 in the lower. The jaws are shorter than in *P. bathybius*; the form is more elongate and the coloration is strikingly different, our species having the anterior half of the body pale, almost whitish, while the snout, chin, and anal origin are black.

The standard length, which is the total without caudal, of the specimen examined is 167 millimeters. The greatest height of the body (25 millimeters) is slightly greater than the length of the head, which is contained 6¼ times in the standard length.

The snout is broad, obtuse, its length (7 millimeters) contained 3½ times in that of the head. The length of the eye equals that of the snout. The interorbital width (11 millimeters) equals the length of the postorbital part of the head. The nostril is about midway between the eye and the tip of the snout, in a very short tube. Five large mucous pores on each side of the snout, 3 smaller ones on the cheek under the eye and 6 on the mandible and edge of the opercular bones. The teeth are minute, villiform, and in two series. The gill-opening is a very small slit, edged with black at the upper angle of the pectoral. The origin of the dorsal is distant from the snout 36 millimeters, or 1½ times the length of the head. The tip of the pectoral when extended is about under the second or third ray of the dorsal. The anal origin is under the ninth or tenth dorsal ray. The length of the middle caudal ray (16 millimeters) is contained 10½ times in the standard length. The longest pectoral ray (18 millimeters) equals half the distance from the snout to the dorsal. The longest ray of the isolated portion of the fin (16 millimeters) equals that of the middle caudal ray. The distance of the vent from the tip of the snout (23 millimeters) is nearly equal to the length of the head. The vent is directly under the base of the pectoral; it is a narrow slit placed horizontally. Pyloric cæca 4 to 6.

Color: Anterior half of body very pale, whitish; posterior half very light brown; snout, chin, and edge of gill-opening and region about the vent black.

Radial formula: D. 60; A. 55; P. 17+4; C. 10.

The eggs of an example a little smaller than the type of the description have a diameter of about 3 millimeters. At the same time the ovaries contain some eggs, which have not reached maturity, whose diameter is only about one-half millimeter. The stomach is a stout subspherical receptacle, its greatest width two-thirds of its length.

The type specimen (Cat. No. 35637, U. S. N. M.) was taken by the *Albatross* on Sept. 13, 1884, from station 2232, in 39° 12′ 17″ N. lat., 72° 09′ 30″ W. lon., at a depth of 520 fathoms. Specimens were also taken by the same vessel from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2187, in 39° 49′ 30″ N. lat., 71° 10′ W. lon., at a depth of 420 fathoms; and fragments of an individual (No. 35479, U. S. N. M.) from station 2186, in 39° 52′ 15″ N. lat., 70° 55′ 30″ W. lon., in 353 fathoms.

HILGENDORFIA, Goode and Bean, n. g.

Liparids with large, high, compressed head whose bones are exceedingly thin, cavernous; jaws even in front. Vertical fins represented by broad median folds, confluent at the posterior end of the body, where the caudal is represented by two or three extremely fine, slender terminal filaments. Pectoral very large, broad-based, with membranes fringed posteriorly and having several of the lower rays free, though not forming a distinct portion of the fin. No ventral disk. Vent far advanced, opposite hind margin of orbit. Gill opening as in *Monomitra*.

The type described by Günther is only 60 millimeters in length, and he remarks concerning it that it is uncertain whether it represents a form in which embryonic characters are persistent, or merely an early stage of development.

Its peculiarities seem sufficient to warrant its being set apart for further study before it is merged with *Paraliparis*. It is named for Dr. Franz Hilgendorf, of the Royal Zoological Museum, Berlin

HILGENDORFIA MEMBRANACEA, (GÜNTHER), GOODE and BEAN.

Paraliparis membranaceus, GÜNTHER, Challenger Report, XXII, 1887, p. 69, pl. XII, fig. D.

Head very large, compressed, about as high as long, with the upper profile descending in a parabolic curve. The abdominal cavity, black and transparent through the integuments, is excessively short; the tail compressed and gradually tapering into a fine point. The whole of the integuments are colorless, with minute scattered points of pigment. A broad median dorsal fold rises from the top of the snout and is continued to the extremity of the tail, gradually disappearing as it approaches the caudal fin, which is represented by two or three extremely fine and rather long terminal filaments. The fold is highest above the posterior portion of the abdomen; there also fin rays commence to be developed, which on the anterior half of the tail are distinct enough, but become more crowded posteriorly and almost indistinguishable. The anal has a similar structure; it also starts as a fold from the vent, which is far advanced, opposite to the hind margin of the orbit; rays are developed from the posterior end of the abdominal cavity, whence the fin is continued in the same manner as the dorsal.

Pectoral fin very large, with a very broad base, extending from the upper end of the gill opening forward nearly to the hyoid bone; its principal portion consists of an extremely delicate membrane, in which rays are visible like fine striæ, and which on its hinder margin is provided with long fringes. The eight lower or anterior rays are quite free, but not separated by an interspace from the remaining part of the fin. The bones of the head are extremely thin, forming cavities on the top and the snout. The eye is of moderate size, about two-sevenths of the length of the head, a little shorter than the snout, and considerably less than the width of the interorbital space, which is very convex. Jaws even in front, the maxillary extending nearly to the hind margin of the orbit. (*Günther.*)

Radial formula: D. ca. 70; A. ca. 70.

One specimen, 2¼ inches long, was obtained by the *Challenger* off Cape St. Vincent, station 310, at a depth of 400 fathoms.

GYMNOLYCODES, Vaillant.

Gymnolycodes, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 312.—BOULENGER, Zoöl. Record, 1888, Pisces, 18.

Body compressed, tapering, ensiform; skin feebly adherent to the subjacent tissues, and scaleless. Vertical fins confluent, pectorals enveloped in an integument; ventrals jugular. Jaws with fine teeth in several rows, disposed in quincunx fashion; vomer and palatines toothless. Branchial opening small and placed a little above the pectorals.

This genus, which Vaillant places in the family *Lycodidæ*, while calling attention to its resemblance to the Brotulids, has been assigned by Boulenger to the *Discoboli*, where we provisionally leave it.

GYMNOLYCODES EDWARDSI, VAILLANT. (Figure 251.)

Gymnolycodes Edwardsi, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 313, pl. XXVI, fig. 3.

Body shaped much as in *Bythites*, its height nearly one-fifth of its thickness and one-seventh of its length; the length of the head is two-ninths of the length of the body; its form is globose (so far as Vaillant was able to judge from a distorted specimen). Length of snout two-fifths that of head. Mouth large, the maxillary extending to the vertical from the center of the eye. On the intermaxillary and mandible are small, smooth, pavement-like teeth, similar to those which occur in certain Elasmobranchs, like *Mustelus*, and certain Rays; palate smooth. Eye moderate, diameter one-fifth of length of head; interorbital width greater, the space equal to one-third that of the head. No barbel has been observed. The branchial orifice consists of a simple opening. Opercular bones apparently imperfectly developed. Branchiostegal membrane supported by rays which are relatively long and strong, which, in the individual as it was captured, are bent, distending the membrane in globular form. Vent a little in advance of the anterior third of the body.

It is impossible, says Vaillant, to know whether there was, or was not, a lateral line, the skin, which is very loose, as in certain species such as *Liparis*, being absent from most parts of the body. Skin absolutely devoid of scales, but studded with numerous pigmentary dots which cover it nearly entirely—head, body, and fins.

The dorsal does not appear to commence very far forward, its origin being nearly in the vertical from the vent; that of the anal considerably farther back. The two vertical fins are similar in appearance and size; they are confluent at the posterior extremity of the body, where, properly speaking, there is no caudal. Pectorals are completely enveloped in the skin, and have from 11 to 13 rays.

When taken out of the dredge the fish was entirely brown; dark upon the fins; belly bluish-black; the inside of the mouth and branchial cavity brownish, with some scattering pigmentary spots.

A single specimen was obtained by the French vessels at station XXI, off the coast of Morocco, at a depth of 1,319 meters.

Family AGONIDÆ.

Agonidæ, Swainson, Nat. Hist. Fishes, 1839, II, 181.—Gill, Arr. Fam. Fishes, 1872, p. 6 (name only, to embrace Günther, II, pp. 211-216).—Jordan and Gilbert, Bull. XVI, U. S. N. M., p. 722.—Gill Proc. U. S. Nat. Mus., XI, 590, 1889.

Body elongate, or more or less elevated, angular, covered with about eight longitudinal series of large, bony, plates, which form a coat of mail; head externally entirely bony, the plates often spinous; eyes large, placed high; suborbital stay cuirassing the cheek; mouth terminal or inferior; barbels often present; teeth small, in villiform bands on the jaws, and often on the vomer and palatines also; gills 3½, no slit behind the last; pseudobranchiæ very large, usually extending down the inner side of the opercle; gill rakers small; gill membranes united, free or joined to the isthmus; ventral fins thoracic, close together, imperfect, I, 2 or I, 3; spinous dorsal small, sometimes absent; anal short, similar to soft dorsal, without spines; caudal narrow, few-rayed; pectorals entire, with broad base, the rays mostly simple; pyloric cæca few; air bladder none. (*Jordan and Gilbert.*)

KEY TO THE DEEP-SEA GENERA OF AGONIDÆ.

I. Spinous dorsal present .... AGONINÆ
  A. Gill membranes joined to isthmus.
    1. Bony plates of body not spiny.
      a. Vomer toothless. No occipital pit .... [AGONUS]
    2. Bony plates of body spinous.
      a. Vomer toothless .... PODOTHECUS
      b. Vomer with teeth.
        Pectorals not notched. Bones of head thin and yielding .... BATHYAGONUS
        Pectorals divided by a deep notch into two portions .... XENOCHIRUS
II. Spinous dorsal obsolete.
  A. Gill membranes free from the isthmus .... ASPIDOPHOROIDINÆ
    1. Bony plates of body keeled but spineless .... ASPIDOPHOROIDES

PODOTHECUS, Gill.

Podothecus, Gill, Proc. Nat. Sci. Phila., 1861, 259 (type, *Podothecus peristethus*, Gill=*Agonus acipenserinus*, Tiles.)

Body elongate, fusiform; head long, compressed, armed above; snout protruding much beyond the small, inferior, U-shaped mouth; teeth very small, in villiform bands; none on vomer or palatines; lower parts of head with barbels; gill membranes united to the isthmus, not forming a fold across it. Plates of body armed with spines; spinous dorsal present. Ventral rays I, 2. (*Jordan and Gilbert.*)

PODOTHECUS DECAGONUS, (Schneider), Jordan. (Figure 259.)

Agonus decagonus, Schneider, Bloch's Syst. Ichth., 1801, 105.—Günther, Cat. Fish. Brit. Mus., II, 215; Challenger Report, XXII, 1887, 65.—Collett, Norges Fiske, 1875, 40; Norsk. Nordh. Exped., 44, pl. II, figs. 11-12.—Lilljeborg, Sverig. och Norg. Fisk., 193.
Archagonus decagonus, Gill, *loc. cit.*
Aspidophorus spinosissimus, Kröyer, Naturhist. Tidsskr., I, 1844, 250.—Gaimard, Voy. Skand., pl. V.
Agonus spinosissimus, Günther, Cat. Fish. Brit. Mus., II, 214.
Leptagonus spinosissimus, Gill, Proc. Acad. Nat. Sci. Phila., 1861, 167.
Aspidophorus malarmoides, Deslongchamps, Mem. Soc. Linn. Norm., IX, 1853, 167.
Brachyopsis decagonus, Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 727.
Podothecus (Leptagonus) decagonus, Jordan, Cat. Fish. N. Amer., 1887, 114.

Body elongate, compressed; head depressed; jaws equal; a pair of spines above the snout, a second above the orbits, a third on the nape, the latter the largest; barbels very short and thick; scales with very prominent spines, 6 series of scales between the ventral fins and the vent; 4 between the vent and the anal fin; pectoral fins much longer than head, one-fourth total with caudal.

Radial formula: D. VI, 7; A. 8; P. 14; L. lat. 41.

Color, yellowish brown, marbled with darker. (*Günther.*)

This form, originally described from Greenland, has since been found also on the coast of Norway and about Iceland and Spitzbergen. Günther states, on what authority we are not aware, that it also occurs about Newfoundland. Although characteristically littoral, it has been found at a depth of 250 fathoms.

BATHYAGONUS, Gilbert.

Bathyagonus, GILBERT, Proc. U. S. Nat. Mus., XII, 1890, 89.

Spinous dorsal developed. Lower jaw the longer. Plates of body spinous. Gill membranes united to the isthmus, not forming a fold across it. Teeth well developed on jaws, vomer, and palatines. Pectorals not notched, the upper rays the longest, the lower becoming regularly shortened. Bones of head thin and yielding, the system of mucous canals very strongly developed. (*Gilbert.*)

This genus is represented by one species, *Bathyagonus nigripinnis*, Gilbert, obtained by the U. S. Fish Commission steamer *Albatross* off the coast of California in 477 fathoms.

XENOCHIRUS, Gilbert.

Xenochirus, GILBERT, Proc. U. S. Nat. Mus., XIII, 1890, 91.

Spinous dorsal present. Jaws equal, or the upper the longest. Plates of body spinous. Gill membranes united to the isthmus, the posterior edge sometimes forming a very narrow free fold across the throat. Teeth well developed on jaws, vomer, and palatines. Pectorals divided by a neep notch into two portions, the lower composed of greatly thickened rays, which are simple and frequently longer than those of the upper lobe. A series of small spines on eyeball above pupil. (*Gilbert.*)

This genus, allied to *Podothecus*, is represented by two species recently taken by the U. S. Fish Commission steamer *Albatross* off the coast of California—*X. triacanthus*, Gilbert, from 77 to 145 fathoms, and *X. pentacanthus*, Gilbert, in 178 fathoms.

ASPIDOPHOROIDES, Lacépède.

Aspidophoroides, LACÉPÈDE, Hist. Nat. Poiss., III, 1802, 228,: (type, *Aspidophoroides tranquebar*, Lac. *Cottus monopterygius*, Bloch).
Anoplagonus, GILL, Proc. Acad. Nat. Sc. Phila., 1861,167, 259.

Body very long and slender, subterete, octangular, tapering into a very long six-sided tail. Head slender, short, with large eye; mouth small, terminal; jaws and vomer with villiform teeth. Dorsal fin single, without spines, very small, inserted nearly opposite the still smaller anal; other fins small; bony plates of body keeled, without spines; gill-membranes broadly united, free from the isthmus. (*Jordan and Gilbert.*)

ASPIDOPHOROIDES MONOPTERYGIUS, (BLOCH). (Figure 260.)

Cottus monopterygius, BLOCH, Ausländ. Fische, II, 156, taf. 178.—RICHARDSON, Fauna Bor.-Amer., Fishes, 50.
Agonus monopterygius, SCHNEIDER, Bloch's Syst. Ichth., 1801, 104.
Aspidophorus monopterygius, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 224; VI, 554, pl. CLXIX.—GÜNTHER, Cat. Fish. Brit. Mus., II, 216.
Aspidophoroides monopterygius, GOODE and BEAN, Amer. Jour. Sci. and Arts, 1877, 477.—GOODE, Proc. U. S. Nat. Mus., 1880, 480.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 725.

Body slender, elongate, its height 9 in its length. Head triangular, much narrowed anteriorly, its length 5⅔ in that of body; nasal spines very large, diverging, inserted near tip of snout; no other spines anywhere; eyes very large, longer than snout; supraocular ridges very high; a ridge extending backward from eye along temporal region; lower jaw slightly included; caudal peduncle very long and slender, forming about two-fifths the length; breast with flat plates; dorsal ridges high anteriorly, the median line of back from snout to dorsal fin concave. Head 5⅔; depth 9.

Radial formula: D. 5; A. 6; L. lat. ca. 50.

Color brownish, obscurely banded with darker; pectorals, dorsal, and caudal mottled or barred.

Up to the time of the visit of the U. S. Fish Commission to Salem in 1877 this species had been very rarely taken south of Greenland, and that mainly from the stomachs of cod, haddock, halibut, and other fishes. Several specimens were dredged by the Commission at Portland and Eastport, Me. Many specimens were taken in Massachusetts Bay, often a dozen coming up in a single haul of the trawl.

In 1874 the head of an individual of this species was dredged up on the "Pecten Ground," off Watch Hill, R. I. This was the first instance of its capture south of Cape Cod.

It was subsequently taken at the following *Albatross* stations: 2502, in 44° 19′ N. lat., 60° 39′ 15″ W. lon., at a depth of 54 fathoms; 2491, in 45° 24′ 30″ N. lat., 58° 35′ 15″ W. lon., at a depth of 59 fathoms; 2522, in 42° 20′ N. lat., 65° 07′ 30″ W. lon., at a depth of 104 fathoms; and 2450, in 46° 45′ N. lat., 50° 02′ 30″ W. lon., at a depth of 44 fathoms.

A specimen, doubtfully assigned to *A. Olriki*, was taken at station 2450, in 46° 45′ N. lat., 50° 02′ 30″ W. lon., at a depth of 44 fathoms.

Family LATILIDÆ.

Latiloidæ, GILL, Proc. Acad. Nat. Sci. Phila.. 1861, 514.
Latilidæ, GILL, Arr. Fam. Fishes, 1872, 9 (No. 97).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 623.

Acanthopterygians with body more or less elongate, compressed. Scales small, ctenoid. Lateral line present, complete. Head subconical, the profile usually convex; suborbital without bony stay; cranial bones not cavernous; opercular bones armed or not. Mouth moderate, terminal. Teeth rather strong. Premaxillary (usually) with posterior canine, protractile; maxillary without supplemental bone, not slipping under edge of preorbital. Gill-membranes often adherent to the isthmus. Dorsal fin long and low, usually continuous, the spinous portion much shorter than the soft. Anal fin elongate, with spines few and feeble. Caudal fin forked; tail diphycercal. Ventrals thoracic or subjugular, perfect. Pectoral fins normal. Vertebræ, 35–50.

LOPHOLATILUS, Goode and Bean.

Lopholatilus, GOODE and BEAN, Proc. U. S. Nat. Mus., 1879, 205 (type, *Lopholatilus chamæleonticeps*, G. & B.).

Dorsal and anal rays few in number. A large adipose appendage on the nape and a fleshy prolongation upon each side of the labial fold, extending backward beyond the angle of the mouth.

LOPHOLATILUS CHAMÆLEONTICEPS, GOODE and BEAN. (Figure 265.)

THE TILE FISH.

Lopholatilus chamæleonticeps, GOODE and BEAN, Proc. U. S. Nat. Mus.. II, 1879, 205.—GOODE, Proc. U. S. Nat. Mus., III, 337, 482.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 624.—COLLINS, Rep. U. S. Fish Comm., 1882 (1884), 237-292.—LUCAS, Rep. U. S. Nat. Mus. (Smithsonian Report), 1889, 647, with colored plate.

A *Lopholatilus* having a stout, somewhat compressed body, with its height contained 3⅓ times in its length (without caudal), and the length of its head 3 times.

Maxillary reaching anterior margin of orbit; opercle and preopercle scaly, the latter finely denticulate; upper jaw with an outer series of stronger teeth, behind which is a band of villiform teeth; lower jaw with a few large canines and an inner series of small conical teeth; vomer and palatines toothless.

Radial formula: D. VII, 15; A. II, 13; scales 8–93–30.

Detailed description.—The greatest height of the body (.306), which is at the ventrals, is contained about 3⅓ times in the length to the origin of the middle caudal rays, and 4 times in the extreme length. Its greatest width (.144) equals the length of the caudal peduncle (.144); this latter being measured from the end of the soft dorsal to the origin of the middle caudal rays. The least height of the tail (.0867) is contained 4 times in the distance of the spinous dorsal from the snout.

The greatest length of the head (.33) is contained 3 times in the length to the origin of the middle caudal rays. Its greatest width (.165) is slightly more than twice the width of the interorbital area (.08). The length of the snout (.122) is contained twice in the length of the pectoral of the right side (.244). The length of the operculum to end of flap (.11) is ⅑ of total length. The length of the upper jaw (.15) equals ½ the height of the body at the ventrals, and is contained 2¼ times in the length of the head. The maxilla extends to the perpendicular through the anterior margin of the orbit; the mandible does not quite reach the perpendicular through the middle of the orbit; the length of the labial appendage is slightly more than half the long diameter of the orbit and one-third the length of the first pectoral ray. The length of the mandible (.156) slightly exceeds the distance from the snout to the orbit (.15), and equals 3 times the long diameter of the eye (.052), which is contained 6½ times in the length of the head. The operculum and preoperculum are scaly; the latter is finely denticulated on its posterior margin. The distance of the posterior nostril from the eye equals the length of the first anal spine; the distance between the anterior nostril and the end of the snout is twice as great. The intermaxillaries are supplied with an outer series of about 19 canine teeth, and behind these a band of villiform teeth, widest at the symphysis. The mandible has a few large canines and an inner series of small conical teeth continued from a patch of similar teeth at the symphysis; vomer and palatines toothless.

The distance of the adipose dorsal from the snout (.206) equals nearly 3 times its height (.07); its length of base (.123) equals the length of the snout. The height of the adipose dorsal equals the distance from the tip of the ventral to the vent.

The distance of the spinous dorsal from the snout (.347) equals the distance of the ventral from the snout (.347); its length of base (.144) equals the length of the caudal peduncle. The first spine is imperfect—what remains of it is one-third as long as the third spine (.09). The second spine (.082) is about equal to the width of the interorbital area. The fourth and the sixth spine are equal in length (.097) and equal the distance from the end of the snout to the posterior nostril. The fifth spine (.095) is a little shorter than the sixth. The last spine, seventh, is contained 10 times in the total length. The length of the first ray of the soft dorsal (.094) equals the distance between the anterior nostril and the end of the snout. The thirteenth and longest ray (.147) about equals the length of the base of the spinous dorsal. The last ray (.07) is half as long as the thirteenth. The thirteenth ray of the soft dorsal extends to the origin of the external caudal rays.

The distance of the anal from the snout (.60) is about equal to twice the height of the body at the ventrals. The length of the anal base (.318) is slightly more than twice the length of the mandible. The first anal spine (.04) is half as long as the second dorsal spine. The second anal spine (.075) is half as long as the upper jaw. The first ray of the anal (.102) is as long as the last spine of the dorsal. The eleventh and longest anal ray (.134) is contained 7½ times in the total length, and nearly equals the length of the middle caudal rays. The last anal ray (.078) is half as long as the mandible. The eleventh ray of the anal extends almost to the perpendicular through the origin of the middle caudal rays.

The caudal is emarginate, the external rays being only 1½ times as long as the middle rays. The length of the superior external rays (.216), measured from the origin of the middle rays, equals 1½ times the length of the spinous dorsal base.

The distance of the pectoral from the snout (.32) very slightly exceeds the length of the anal base. The length of the pectoral of the right side (.244) equals twice that of the snout. The pectoral of the left side is probably imperfect, its length (.216) being equal to that of the superior external caudal rays. The right pectoral can be made to reach the vent; in its natural position it extends to the perpendicular let fall from the fourth ray of the second dorsal.

The distance of the ventral from the snout (.347) equals 4 times the least height of the tail. The length of the ventral (.183) equals twice that of the third dorsal spine, and it extends to a point under the third dorsal ray. The distance from the tip of the ventral to the vent equals half the length of the middle caudal rays. The vent is under the interval between the fourth and fifth dorsal rays.

Color.—The following notes upon color were taken from a fresh specimen. The colors are very beautiful, and in general appearance when taken from the water it is one of the loveliest fishes we have ever seen, no exception being made in favor of the brilliant parrot-fishes or angel-fishes of the West Indian coral groves.

Back bluish, with a green tinge, iridescent, changing through purplish blue and bluish gray to rosy white below, and milky white toward the median line of the belly. Head rosy, iridescent, with red tints most abundant on the forehead, blue under the eyes, cheeks fawn-colored. Throat and under side of the head pearly white, with an occasional tint of lemon-yellow; this is most pronounced in front of the ventrals and on the anterior portion of ventral fins. Back with numerous maculations of bright lemon or golden. Anal purplish, with blue and rose tints, iridescent. Margin of anal rich purplish blue, iridescent like the most beautiful mother of pearl; this color pervading more or less the whole fin, which has large yellow maculations. The lower border is rose-colored like the belly, and the base of the fin also partakes of this general hue. Dashes of milk-white on the base of the anal between the rays.

Dorsal gray. In front of the seventh dorsal the upper third posterior to the upper two-thirds dark brown. Spots of yellow, large, elongate, on or near the rays. Adipose fin whitish brown or yellow; a large group of bright yellow, confluent spots at the base.

Pectorals sepia colored with rosy and purplish iridescence.

Viscera.—Stomach small, siphonal, barely more than a loop in the very large intestine. Alimentary canal short, stomach and intestine when stretched out at full length extending from the diaphragm to the caudal. A loop in the intestine immediately posterior to the stomach. Liver with two lobes, nearly equal in length, light chestnut-brown. Gall-bladder large, pendent, pear-shaped, with long duct. Swim-bladder simple, with thick muscular walls, strongly attached to roof of abdominal cavity by numerous root-like appendages, resembling somewhat those of *Pogonias*. Spleen two-thirds as long as gall-bladder.

TABLE OF MEASUREMENTS.

[The unit of comparison is the length to the origin of the middle caudal rays.]

Current number of specimen	22,889.	
Locality	80 miles S. by E. of Noman's Land.	
	Millimeters.	100ths of length.
Length to origin of middle caudal rays	692	....
Length to end of middle caudal rays	788	....
Body:		
Greatest height (at ventrals)	212	30.6
Greatest width	100	14.4
Least height of tail	60	8.67
Length of caudal peduncle	100	14.4
Head:		
Greatest length	230	33
Greatest width	114	16.5
Width of interorbital area	56	8
Length of snout	85	12.28
Length of operculum	77	11
Length of upper jaw	105	15
Length of mandible	108	15.6
Distance from snout to orbit	103	15
Long diameter of eye	36	5.2
Dorsal (adipose):		
Distance from snout	143	20.66
Length of base	85	12.28
Greatest height	48	7
Dorsal (spinous).		
Distance from snout	240	34.68
Length of base	100	14.4
Length of first spine (possibly broken)	20	3
Length of second spine	57	8.24
Length of third spine	63	9.1
Length of fourth spine	67	9.68
Length of fifth spine (possibly broken)	66	9.54
Length of sixth spine	67	9.68
Length of seventh spine	70	10
Dorsal (soft):		
Length of base	300	43.35
Length of first ray	65	9.4
Length of longest ray (thirteenth)	102	14.74
Length of last ray	48	7
Anal:		
Distance from snout	416	60
Length of base	220	31.79
Length of first spine	29	4.2
Length of second spine	52	7.5
Length of first ray	71	10.26
Length of longest ray (eleventh)	93	13.44
Length of last ray	54	7.8

TABLE OF MEASUREMENTS—continued.

Current number of specimen		22,880.	
Locality		50 miles S. by E. of Noman's Land.	
		Millimeters.	100ths of length.
Caudal:			
Length of middle rays		96	13.87
Length of external rays	superior	150	21.67
	inferior	145	21
Pectoral:			
Distance from snout		223	32.22
Length	right side	169	24.42
	left side	150	21.67
Ventral:			
Distance from snout		240	34.68
Length		127	18.35
Branchiostegals		VI	....
Dorsal		VII, 15	....
Anal		II, 13	....
Caudal		18	....
Pectoral		II, 15	....
Ventral		I, 5	....
Number of scales in lateral line		93	....
Number of transverse rows above lateral line		8	....
Number of transverse rows below lateral line		30	....

This fish was first observed in 1879, when a Cape Ann schooner, the *Wm. V. Hutchings*, while setting trawl lines for cod on Nantucket shoals, took several hundred specimens. The capture of so large a fish so entirely unlike anything known in American waters excited much interest, and it was at first thought that it might become of economic importance. The genus and species were immediately described, and a popular name was proposed, taken from the fourth syllable of the name of the genus.

In July of the same year, the schooner *Clara F. Friend*, while fishing for cod in the same region, obtained nine of them at a station 50 miles south by east of Noman's Land, in N. lat. 40° 10′, W. lon. 70° 55′, at a depth of 75 fathoms, on very hard clay bottom. In September the Fish Commission steamer *Fish Hawk* went to the same region to search for them.

The first trip of the *Fish Hawk* to deep water from Newport was on September 4, and the nets were hauled as nearly as possible on the same grounds where *Lopholatilus* had previously been taken. The second trip, ten days later, was to a region about 40 miles farther west, and on this occasion six or more large individuals of this species were brought up on a hand line (ladder line) set from an open boat sent out from the steamer. None were at any time taken in the trawl nets, though there is every reason to believe from the success of the fishing vessels previously, and from the number taken on the hand line by the men in the small boat, that they were exceedingly abundant in this locality, and probably for hundreds of miles in either direction, or at any rate to the south.

In 1880 and 1881 the *Fish Hawk* took tile fish on several occasions at depths of from 70 to 134 fathoms. The indications of the apparent abundance of a new and edible fish of large size made Prof. Baird desirous of obtaining fuller knowledge of its habits and habitat, in the hope that it might readily be taken in large numbers and prove an important addition to the list of food-fishes. Unfortunately the Fish Commission had not yet built the schooner *Grampus*, so, having no vessel especially adapted for fishery research and prepared to encounter all weather, it was necessary to charter a fishing smack for the work. Unfortunately, too, bad or threatening weather seemed to have been chartered with the smack, and only a brief and unsatisfactory trial could be made on the tile fish ground, so that research was of necessity postponed until 1882. In the months of March and April, 1882, vessels arriving at Philadelphia, New York, and Boston reported having passed large numbers of dead or dying fish scattered over an area of many miles, and from descriptions and the occasional specimens brought in, it was evident that the great majority of these were tile fish. Naturally these fish were not evenly distributed over all the area in which they were seen, some observers reporting them as scattering, and others as at times so numerous that there would be as many as fifty on the space of a rod square. As one account after another came in it became apparent that a vast destruction of fish had taken place, for vessels reported having sailed for 40, 50, and 60 miles through floating fish; and in one case the schooner *Navarino* sailed for above 150 miles through waters dotted as far as the eye could reach with dying fishes. Computations made by Capt. J. W. Collins, seemed to indicate that an area of from 5,000 to 7,500 square statute miles was so thickly covered with dead or dying fish that their numbers must have exceeded the enormous number of one billion. Since there were no signs of any disease, and no parasites found on the fish brought in for examination, their death could not have been brought about by either of these causes; and many conjectures were made as to the reason of this wholesale destruction of deep-water fishes, such as would ordinarily be unaffected by conditions prevailing at the surface, submarine volcanoes, heat, cold, and poisonous gases being variously brought forward to account for the loss of life.

Prof. Verrill has noted the occurrence of a strip of water, having a temperature of 48° to 50° F., lying on the border of the Gulf-Stream slope, sandwiched between the Arctic current on the one hand and the cold depths of the sea on the other. During 1880 and 1881 Prof. Verrill dredged along the Gulf-Stream slope, obtaining in this warm belt, as he terms it, many species of invertebrates characteristic of more southern localities. In 1882 the same species were scarce or totally absent from places where they had previously been abundant, and this taken in connection with the occurrence of heavy northerly gales and the presence of much inshore ice at the north, leaves little doubt that some unusual lowering of temperature in the warm belt brought immediate death to many of its inhabitants. This is the more probable, as it is a well-known fact that sudden increase of cold will bring many fish to the surface in a benumbed or dying condition, and there are no indications of any shock or earthquake having occurred at the time the dead fish were first noticed.[1]

For several years the fish was believed to have become entirely extinct, and so convinced were naturalists of this that a chapter was devoted to it in a paper by Mr. Lucas in the Report of the National Museum for 1889 upon "Animals recently extinct." Several visits were made by Fish Commission vessels to the old *Lopholatilus* grounds, but all attempts to obtain specimens were fruitless.

In the fall of 1892 Col. Marshall McDonald, the Commissioner of Fisheries, made another attempt to discover the fish, and was successful, obtaining it from the following stations: A single specimen on August 6, in 40° 06′ N. lat., 71° 00′ W. lon., in 78 fathoms; one specimen on August 18, in 40° 08′ N. lat., 71° 08′ W. lon., in 78 fathoms; one specimen on September 17, in 39° 26′ N. lat., 72° 22′ W. lon., at a depth of 74 fathoms; three specimens on September 18, in 39° 20′ N. lat., 72° 27′ W. long., in 77 fathoms, and two specimens on October 8, in 38° 40′ N. lat., 73° 09′ W. lon., at a depth of 80 fathoms.

The tile fish then is restored to the list of existing species of our North Atlantic coast, and it is probable that in time it may attain to its former abundance. The temperature investigations made by Col. McDonald have been carefully discussed by him, and he is convinced that the destruction of *Lopholatilus* was due entirely to climatic causes.

Family PERCOPHIDÆ.

Percophidæ, ADAMS, Manual of Natural History, 1854, 108.—GILL, Century Dictionary.

Acanthopterygian fishes with elongate body, pointed head, a short first and a long second dorsal, and complete thoracic ventrals, moderately approximated. (*Gill.*)

APHRITIS, Cuvier and Valenciennes.

Aphritis, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, 483.—GÜNTHER, Cat. Fish. Brit. Mus., II, 242.

Body cylindrical, elongate; cleft of the mouth slightly oblique, with the lower jaw rather longer; eye lateral. Scales rather small, minutely ciliated. Two separate dorsals (the first with 6 spines); ventrals jugular, with 1 spine and 5 soft rays; the lower pectoral rays branched. Villiform teeth in the jaws, on the vomer (and the palatine bones), without canines. Operculum with a flat point; preoperculum entire. Six branchiostegals. Air bladder, none; pyloric appendages in small number. (*Günther.*)

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[1] Notes by F. A. Lucas.

This genus includes several forms from Van Diemen's Land, the west coast of Patagonia and South America, and is represented in the deep-sea fauna by the species *A. gobio*, Günther (Challenger Report, I, Part VI, Shore Fishes, 1880, 21, Pl. IX), obtained at *Challenger* stations 307, in 147 fathoms, and 312, in 10-15 fathoms; in the Antarctic fauna of Magellan Straits, and the littoral archipelago on the western side of the extremity of the South American continent. Specimens were obtained from 6 to 18¼ inches in length.

ACANTHAPHRITIS, Günther.

Acanthaphritis, GÜNTHER, Challenger Report, I, Part VI (Shore Fishes), 1880, 43.

Head depressed, tail compressed. Cleft of the mouth subhorizontal, with the upper jaw longer. Eye rather large, obliquely directed upwards. Scales large, ciliated. Two separate dorsal fins, the first with five or six spines. Ventrals jugular, with 1 spine and 5 soft rays. The lower pectoral rays branched. Bands of villiform teeth in the jaws, without canines; vomerine teeth in two small, widely separated patches. Opercles unarmed; each preorbital with a horizontal spine pointing forward. Six branchiostegals. Gill membranes entirely separate from each other, and from the isthmus. (*Günther.*)

This genus is represented by a single species, *A. grandisquamis*, Günther (loc. cit., pl. XVIII, Fig. A), represented by specimens obtained by the *Challenger* at station 192, near the Ki Islands, at a depth of 129 fathoms.

Family CHÆNICHTHYIDÆ.

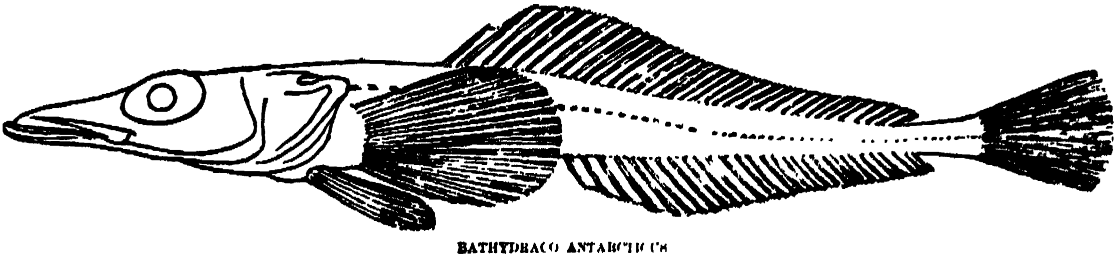
Chænichthyoidæ, GILL, Proc. Acad. Nat. Sci. Phila., 1861, 507.
Chænichthyidæ, GILL, Arr. Fam. Fishes, 1872, 9 (No.93); Century Dictionary, 907.

Acanthopterygian fishes typified by the genus *Chænichthys*, and including those Percophoidea which have the snout produced and spatuliform, the body mostly naked, and two dorsal fins, the first of which is short and the second long. (*Gill.*)

BATHYDRACO, Günther.

Bathydraco, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 18; Challenger Report, XXII, 18.

Body elongate, subcylindrical; tail tapering and very attenuated behind; head depressed, with snout much elongate, spatulate; mouth wide, horizontal, with the lower jaw prominent; eyes very large, vertical, close together. Scales very small, embedded in the skin. Lateral line rather wide, continuous. One dorsal fin; ventrals jugular; the lower pectoral rays branched. Teeth in the jaws in villiform bands; none on the vomer or the palatine bones. Opercles unarmed; ten branchiostegals; the gill-membranes free from the isthmus and but slightly united in front. Air-bladder none. Gills 4. Pseudobranchiæ none. Gill-rakers short.



BATHYDRACO ANTARCTICUS

The type of this genus is *Bathydraco antarcticus*, Günther (*loc. cit.*, Pl. VIII, Fig. A), taken by the *Challenger*, south of Heard Island (station 152), at the depth of 1,260 fathoms.

HYPSICOMETES, Goode.

Hypsicometes, GOODE, Proc. U. S. Nat. Mus., III, 1880, 347.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus. 808.

Body elongate, subcylindrical, tapering posteriorly. Head very large, much depressed, with snout elongate, spatulate; cleft of mouth very wide, horizontal, with the lower jaw much the longer; the posterior margin of the maxillary wide, free, and with a long cutaneous flap. Eyes very large, close together, subvertical. Scales large, cycloid, deciduous; lateral line conspicuous and continuous, with scales smaller than those of the body adjoining, not granular, its line descending abruptly in a catenary curve in the region over the pectorals. Teeth acicular; in bands on the jaws, vomer, and palatines, the largest being upon the palatines, the vomer, and upon two pads on either side of the symphysis of the maxillary. A sharp, short, strong scapular spine. Opercle with three feeble, sharp spines, each at the end of a long feeble ridge; a long, skinny opercular flap extending far beyond the bony portion, and covered with scales. Branchiostegals, 6. Gill-membranes free from the isthmus, except far in front, where they are united to it; the left-hand flap overlapping the right at the point of junction. Pseudobranchiæ present. Gill-rakers short.

This genus resembles *Chænichthys*, in many particulars, in its general structure, though distinguished by the presence of scales and the different position of the lateral line, which descends in a catenary curve from under the tip of the opercular flap to the middle region of the body, about halfway from the pectorals to the caudal; by the greater depression of the head, the sharper snout, the smaller mouth, and the location of the eyes, which are subvertical instead of lateral, and are separated by a very narrow interorbital space; and also by the presence of teeth upon the vomer and palatines. It resembles *Bathydraco* in general appearance, but is clearly distinguished from it by the presence of two dorsal fins, instead of a single one, by the armed opercles, by the presence of scales upon the snout, by the presence of teeth upon the vomer and palatines, and by having 6 instead of 10 branchiostegals.

HYPSICOMETES GOBIOIDES, GOODE. (Figure 263.)

Hypsicometes gobioides, GOODE, Proc. U. S. Nat. Mus., III, 1880, 347.—JORDAN and GILBERT, *loc. cit.*

The greatest height of the body is about one-third of the length of the head, which (measuring from the tip of the snout to the tip of the opercular flap) is contained a little less than two and one-half times in the total length of the body (without caudal). Mouth very wide, horizontal; the maxillary, which is expanded spoon-like posteriorly, reaching considerably beyond the vertical from the anterior margin of the orbit. The diameter of the orbit is contained 1⅓ times in the length of the snout and 4⅓ times in the length of the head (flap included), its location being considerably nearer to the tip of the snout than to the end of the flap, and equidistant between the tip of the snout and the tip of the uppermost spine of the operculum.

The entire upper surface of the head is covered with scales, except upon the bony portion of the snout, and so are also the cheeks and opercula. The first dorsal fin is placed far forward, not far behind the vertical from the axil of the pectoral; the interspace between the termination of the first dorsal and the beginning of the second is equal to the diameter of the orbit. This fin is composed of six spines, the first and second of which are the longest, equal to the distance from the anterior margin of the orbit to the tip of the lower jaw, and is triangular in form. The origin of the second dorsal is almost in the vertical from that of the anal, and terminates a little in advance of the latter. The second dorsal fin is highest in front and low behind. The length of the caudal peduncle is a little less than the length of the snout. Caudal rounded. Pectoral very broad at base, rounded, extending beyond the vent and nearly to the vertical from the origin of the anal; lower rays branched. Ventrals far apart, horizontal, *Trigla*-like, composed of one flexible spine and five branched rays, their insertion far forward and far in advance of the base of the pectorals.

Radial formula: D. VI, 15–17; A. 16–18; V. I, 5; P. 26; L. lat. 65.

Color, grayish brown: lighter and yellowish below.

Species and genus were based upon a very small specimen, and many of the important characters were not discernible. This specimen (Cat. No. 26007, U. S. N. M.) was taken by the *Fish Hawk* from station 871, in 40° 02′ 54″ N. lat., 70° 23′ 40″ W. lon., at a depth of 115 fathoms, and was much contracted and distorted from immersion in strong alcohol. Numerous examples have since been obtained and the descriptions entirely recast. It was taken by the *Blake* from station LVI, off St. Vincent, in 95 fathoms, and from station LI, off St. Kitts, in 208 fathoms; also by the *Albatross* from station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms; from station 2134, in 19° 56′ 06″ N. lat., 75° 47′ 32″ W. lon., at a depth of 254 fathoms; from station 2398, in 28° 45′ N. lat., 86° 26′ W. lon., at a depth of 227 fathoms; from station 2403, in 28° 42′ 30″ N. lat., 85° 29′ W. lon., at a depth of 88 fathoms; from station 2399, in 28° 44′ N. lat., 86° 18′ W. lon., at a depth of 196 fathoms; from station 2376, in 29° 03′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms; from station 2378, in 29° 14′ 30″ N. lat., 88° 09′ 30″ W. lon., at a depth of 68 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon., at a depth of 280 fathoms; from station 2377, in 29° 07′ 30″ N. lat., 88° 08′ W. lon., at a depth of 210 fathoms.

CHAMPSODON, Günther.

Champsodon, GÜNTHER, Proc. Zoöl. Soc. London, 1867, 102; Challenger Report, I, Part VI (Shore Fishes), 52.

Body compressed, elongate, covered with minute granular scales, and with two lateral lines, each provided with lateral vertical branches. Cleft of mouth oblique, very wide, the tip of the maxillary extending very far behind the posterior margin of the orbit. Eye lateral, directed upward, close to the upper profile of the head, and comparatively small. Two dorsal fins, the first composed of five rays; the second dorsal and anal similar in shape and height, the anal slightly shorter than the dorsal, beginning slightly behind it and ending slightly in advance of its last rays. Caudal peduncle stout, long; caudal furcate. Ventrals jugular, inserted somewhat in advance of the base of the pectoral and extending almost to the vent. Pectoral median, very short. Teeth in jaws in a single series, not closely set, of unequal size, those of the lower jaw longer than the upper ones; vomerine teeth cardiform, in two separate patches; palatine teeth, none. Gill openings exceedingly wide. Angle of preoperculum armed with a long, lanceolate spine obliquely directed upward, and with several denticulations on the hind margin of the same bone. Preorbital with 1 or 2 spines. (From descriptions and figures of Günther.)

The type of this genus and the only species is *C. vorax* (Günther, *loc. cit.*; Challenger Report, VI, Pl. XXIII, Fig. A). It occurs in the China seas, and was obtained by the *Challenger* in the Arafura Sea, near the Ki Islands, at station 192, in 129 fathoms; and near the Philippines, at station 204, in 115 fathoms; also by the *Investigator* in the Bay of Bengal, 100 fathoms (Alcock, Ann. and Mag. Nat. Hist., 1889, Nov., 381).

Family CHIASMODONTIDÆ, Gill.

Chiasmodontidæ, GILL in JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 1882, 964; Century Dictionary, 953.

Acanthopterygians, with an elongate, subcylindric or slightly tapering form and subconic head. Skin naked. Two dorsal fins, the first of slender spines and short, the second dorsal and anal long; ventrals thoracic and normal (I, 5). Mouth very deeply cleft, reaching beyond the eyes, with numerous long, sharp, and (in front) movable teeth. Teeth on palatines. Upper jaw not protractile, covered by an integument in common with the snout anteriorly. Opercular apparatus very oblique and reduced.

CHIASMODON, Johnson.

Chiasmodon, JOHNSON, Proc. Zoöl. Soc. London, 1863, 408.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 810.

Chiasmodus, GÜNTHER, Cat. Fish. Brit. Mus., V, 435, *et alibi*.

Body elongate, compressed, naked; belly pendent, its walls membranaceous, capable of great dilation. Mouth very large; lower jaw longer, no barbel; jaws with two series each of large, pointed teeth, some of the anterior ones very large and movable; vomerine teeth, none; palatines with teeth similar to those in the jaws. Gills, 4. Gill-openings very wide, with membranes slightly joined to isthmus. Pseudobranchiæ none. Dorsal fins, two; anal, single; ventrals inserted below pectorals, with five soft rays. Tail not isocercal, truncate at base of caudal. Caudal forked.

CHIASMODON NIGER, JOHNSON. (Figures 264, 264 A.)

Chiasmodon niger, JOHNSON, Proc. Zoöl. Soc., 1863, 408.—JORDAN and GILBERT, *loc. cit.*
Chiasmodus niger, GÜNTHER, *op. cit.*, 435; Proc. Zoöl. Soc., 1866, 38; Challenger Report, XXII, 1887, 99.—CARTER, Proc. Zoöl. Soc., 1866, 35–39, pl. II.

Head compressed, elongate, the crown flat, its depth less than half its length, which is two-sevenths that of the body; maxillary reaching angle of operculum; both jaws armed with long, pointed wide-set teeth, nearly all of which are movable; two anterior teeth of upper jaw very long, crossing each other when depressed; three anterior pairs of teeth in lower jaw likewise prolonged, the third pair the longest; palatines with a longer, fixed tooth in front. Eye moderate, above the anterior part of maxillary, 4½ in head, shorter than snout, as wide as interorbital space. Lateral line in a longitudinal groove. First dorsal of slender rays, its base 2¼ in that of second dorsal; anal commencing behind second dorsal, its anterior rays without connection with vertebral column; posterior rays of anal and dorsal very feeble; pectoral as long as head without snout; ventral half as long as pectoral.

Radial formula: D. XI, 28; A. 27; P. 13; V. 5.

Color, entirely black. (*Günther.*)

The first specimen of this remarkable fish was obtained at Magdalena (Madeira), at a depth of 312 fathoms, in 1850, by Lowe, who, however, omitted to give a description of it. The species was rediscovered at the same locality by Johnson twelve years later. A third specimen was picked up from the surface, near the island of Dominica. A fourth example was obtained by the *Challenger* in mid-Atlantic, at station 107, in 1500 fathoms, on August 26, 1873. A fifth was obtained by the U. S. National Museum from Capt. Thomas F. Hodgdon of the Gloucester schooner *Bessie W. Somers*. It was found on Le Have Bank, floating on the surface, in June, 1880.

It is evidently an inhabitant of very great depths.

PSEUDOSCOPELUS, Lütken.

Pseudoscopelus, LÜTKEN, Spolia Atlantica (2), 1892, 65; Vid. Selsk. Skr. (6) Naturv. Og. Math., Afd. B. II (6), 1892, 285, pl. 1, figs. 3, 4, 5.

Body fusiform, scaleless. Mouth and gill-openings very large. Eyes moderate and mouth with slender teeth turned inward and placed close together. Ventral fins subthoracic. The first dorsal short; second dorsal as long as the anal. Prominent and conspicuous lines of pores along the upper jaw and mandible; also a second line of pores in front of the ventral fins; another line of pores unites the base of the ventrals and runs down the inner ventral ray on either side. The median line of pores divides into two in front of the vent and passes on either side of the anal fin, terminating at its posterior extremity. A short median line on the underside of body in front of the root of caudal. The lateral line runs almost directly from the upper angle of the gill-opening to the base of the caudal, curving slightly upward.

PSEUDOSCOPELUS SCRIPTUS, LÜTKEN. (Figure 266.)

Pseudoscopelus scriptus, LÜTKEN, Spolia Atlantica, (2) 1892, 284, 285.

This is a little fish with the ordinary fish shape, whose greatest height (15 millimeters) is contained 5½ times in the total length (82 millimeters, caudal included), the length of the head, the form of which shows no peculiarity, scarcely 4 times. The fine skin was evidently altogether scaleless. The gill cavities are comparatively large; the gill membrane, however, is not free from the isthmus in front. The upper jaw, which is formed by the intermaxillary alone, bears along its margin a series of small teeth, and inside of these is a series which is directed inward toward the mouth, whose palate on both sides is furnished with numerous thin and feeble teeth, directed inward toward the mouth and arranged in a cardiform band; the vomer, on the contrary, is toothless. The teeth of the mandible are variable in size, some long, some short. The eye is of medium size, its diameter less than its distance from the point of the snout. Many of the scales of the head—forehead and nuchal regions—and the upper ridge of the shoulder girdle show well-developed sculpturings. The mucous pores of the head (pits and branches of the lateral line) are especially developed on the forehead and temporal regions, behind the eyes, along the preoperculum, etc. On many parts of the skin are seen sharply defined lines; series of closely placed pores—for example, a series begins on the isthmus, close behind the angle formed by the gill opening, and runs along the median line of the body until about the ventral fins, then begins again a little behind these and continues to the vent, where it is divided into two branches, the first curved up on the side and so backward, running along parallel to, but at some distance from the anal fin on each side for its whole length; finally there is a little posterior broader portion in the middle line in front of the caudal fin. Immediately behind the ventral fins there is a short cross line of the same structure, and it is continued on each side at a right angle along the innermost ventral ray. The lateral line consists of only a single series of rather large pores, but the pore system of the above-named species is found besides along the upper and under jaws; as for the upper jaw, however, only along its posterior portion; the mandibulary line of pores is divided into two parts. The ventral fins are located immediately behind the pectorals, whose length is nearly 3 times as great. The short first dorsal fin begins immediately over the ventrals; the second, longer dorsal fin and the anal fin have an equal extent, and are separated somewhat widely from the caudal; both are very low in their posterior half.

Radial formula: D. 8+22 (?); A. ca. 22; P. 13; V. 6.

PONERODON, Alcock.

Ponerodon, ALCOCK, Ann. and Mag. Nat. Hist., 1890, II, 203.

Acanthopterygians, with body elongate, naked. Eyes lateral. Two separate dorsal fins, of which the second is much the longer, and equal, opposite, and similar to the anal; ventrals thoracic; pectoral rays branched. Cleft of mouth extremely wide; jaws distensible and armed with canine teeth, as are also the palatines. Gill openings very wide, the gill-membranes united anteriorly; preoperculum with a (small) spine at its angle; 7 branchiostegals; pseudobranchiæ. Lateral line single, uninterrupted. Abdominal cavity enormous. No air-bladder. No pyloric cæca. No anal papilla. Vertebræ 14/24.

This genus is represented by a single species (*Ponerodon vastator*, Alcock, *op. cit.*, 203, pl. IX, fig. 5), obtained by the *Investigator* in 1890, at station 102, off the Madras coast, at a depth of 690 to 920 fathoms.

Family URANOSCOPIDÆ.

Uranoscopidæ, GILL, Proc. Acad. Nat. Sci. Phila., 1861, III; Arr. Fam. Fish., 5 (No. 41).- JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 629.

Uranoscopina, GÜNTHER, Cat. Fish. Brit. Mus., II, 225.

Body oblong, widest and usually deepest at the occiput. Scales adherent, small, smooth, arranged in oblique series, sometimes wanting. Lateral line near dorsal outline, feeble or obsolete. Head cuboid, partly mailed above. Eyes vertical, small and anterior, on the top of the head. Mouth vertical, with strong and prominent mandible; lips more or less conspicuously fringed; teeth moderate, on the jaws, and usually on the vomer and palatines also; premaxillaries protractile; maxillary broad, without supplemental bone, not slipping under the preorbital. Gill-openings large; gill membranes free from isthmus, nearly separate. Branchiostegals 6. Gills 3½, a small slit behind the last. Pseudobranchiæ present. No anal papilla. Dorsal fins 1 or 2, spinous part short, soft part elongate; anal long. Caudal not forked. Pectoral fins with broad, oblique bases, the lower rays rapidly shortened, most of them branched. Ventrals jugular, close together, I, 5, the spine very short, the innermost rays the longest. Air-bladder generally absent. Pyloric cæca in moderate number.

URANOSCOPUS, Linnæus.

Uranoscopus, LINNÆUS, Systema Naturæ, ed. x, 1758, I, 250.—CUVIER, Règne Animal, ed. I, 1817, II, 301.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., III. 285.—GÜNTHER, Cat. Fish. Brit. Mus., II, 226.

Head large, broad, partly covered with bony plates; body somewhat cylindrical; cleft of the mouth vertical; eye on the upper side of the head. Scales very small. Two dorsals, the first with three to five spines; ventrals jugular; pectoral rays branched. Villiform teeth in the jaws, on the vomer, and palatine bones, without canines; generally a filament below and before the tongue; opercular apparatus generally armed; cavity of the gills with an opening above the operculum as well as posteriorly. Pseudobranchiæ; six branchiostegals. Air-bladder none; pyloric appendages in moderate number. (*Günther.*)

Uranoscopus crassiceps, Alcock, a species with an immense inflated head (Ann. and Mag. Nat. Hist., 1890, II, 205), was taken by the *Investigator* in the Bay of Bengal at station 96, in 98–102 fathoms. One of the 25 specimens captured had in its stomach 7 specimens of *Scopelus pterotus*. It is very possibly a resident beyond the hundred-fathom line.

Family BATRACHIDÆ.

Batrachidæ, SWAINSON, Nat. Hist. Fish, etc., 1839, II, 184, 282.—GÜNTHER, Cat. Fish. Brit. Mus., III, 166.—GILL, Arr. Fam. Fish., 1872, 5 (No. 11).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 750.

Body depressed in front, compressed behind; head large, depressed, with unarmed cheeks and with conspicuous muciferous channels. Teeth strong. Premaxillaries protractile. Gills 3, a slit behind the last. Pseudobranchiæ none. Gill-openings lateral, with membranes broadly united to isthmus. Gill-rakers present, moderate. Suborbital without bony stay; post-temporal bone simple, undivided; scales small, cycloid, or wanting. Dorsal fins two, the first of 2 or 3 low, stout spines; soft dorsal elongate and similar to anal, but shorter. Ventrals jugular, rather large (I, 2 or I, 3). Pectorals very broad, the rays branched; pyloric cæca none. Caudal distinct, rounded.

Genus PORICHTHYS, Girard.

Porichthys, GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, 141.—GÜNTHER. *op. cit.*, 175.—JORDAN and GILBERT, *op. cit.*, 751.

Body cottiform. Head rather broad, depressed, the lower jaw projecting; mouth wide with conical teeth in jaws, and a canine on either side of vomer; operculum with single spine. Skin naked, with several series of distinct mucous pores. Spinous dorsal with 2 minute spines. Pectoral broad. Branchiostegals VI. Air bladder in two lateral parts. Vertebræ 11+31. (*Jordan and Gilbert.*)

PORICHTHYS POROSISSIMUS, (CUV. & VAL.), GÜNTHER. (Figure 267.)

Batrachus porosissimus, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 501.
Porichthys porosissimus, GÜNTHER. *op. cit.*, III, 176.—JORDAN and GILBERT, *loc. cit.*

Depth of body one-sixth of its total length. Head narrowed anteriorly, its length 3⅜–4½ in total length. Head with several rows of fringed pores; 2 concentric series on the abdomen, the outer extending forwards between bases of ventrals. Ventrals reaching bases of pectorals. Pectorals reach to vertical from sixth anal ray. Caudal not half as long as head. Color olive-brown above, with coppery reflections, the belly brassy-yellow; sides with irregular broad, vertical cross-blotches, most distinct in the young; dorsal grayish with oblique dark bars; vertical fins sometimes margined with black; pores of lateral lines bead-like, shining silvery; a white space below eye, with a black crescent below it.

Radial formula: D. II, 37; A. 33; V. I, 2; P. 18.

This form, well known on the western coasts of tropical America, occurs in deep water in the Carribean, having been found by the *Blake* at station CLXXVI, on the Alacran Shoals, at a depth of 35 fathoms, and at station XXXIV, off Granada, at a depth of 92 fathoms; also by the *Albatross* at station 2417, in 33° 18′ 30″ N. lat., 77° 07′ W. lon., at a depth of 95 fathoms; at station 2418, in 33° 20′ N. lat., 77° 05′ W. lon., at a depth of 90 fathoms; at station 2121-2 at a depth of from 31 to 34 fathoms; and at station 2122, in 10° 37′ N. lat., 61° 44′ 22″ W. lon., at a depth of 34 fathoms.

One individual lot (2121-2) correspond, in their dull coloration with *P. porosissimus* as described by Günther. The others are all colored in the manner described for *P. plectrodon*, Günther.

Thalassophryne maculosa, Günther, has been found at a depth of 42 fathoms, and possibly occurs at a still greater depth.

Family GOBIIDÆ.

Les Gobioides, CUVIER, Règne Animal, ed. I, 1817, II, 219; ed. 2, 1829, II, 236.

Gobiidæ, BONAPARTE, Saggio, 1832, 35; Icon. Faun. Ital., Introd.; Cat. Metodico, 1846, 63.—SWAINSON, Nat. Hist. Fishes, etc., 1839, 183, 278.—GÜNTHER, Cat. Fish. Brit. Mus., III, 1.—GILL, Arr. Fam. Fish., 1872, 6 (No. 52); Century Dictionary, 2560.

Gobioidei, BLEEKER, Tentamen, 1859, 21.

Body stout, usually tapering from head to tail, sometimes more elongated, ovate, compressed. Scales diversiform, ctenoid, cycloid, or wanting. No lateral line. Generally two spinigerous dorsal fins, sometimes united in one. Ventrals thoracic (normally I, 5), usually contributing to form a ventral sucker. An anal papilla.

GOBIUS, Cuvier.

Gobius, CUVIER, Règne Animal.—GÜNTHER, (in part), Cat. Fish. Brit. Mus., III, 3.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 633.

Body more or less elongate, compressed behind. Eyes high, close together. Mouth moderate. Teeth conical, on jaws only, in several series, those in outer row larger. Isthmus broad. Scales ctenoid; cheeks usually, and belly sometimes, naked. Dorsal usually with 6 spines. Pectorals large. Ventrals completely united. Caudal fin obtuse.

Gobius cometes, Alcock (Ann. and Mag. Nat. Hist., 1889, II, 208, pl. VIII, fig. 2), occurs below the hundred-fathom line in the Bay of Bengal, about 350 specimens having been taken at *Investigator* station No. 96.

GOBIUS LESUEURII, Risso.

Gobius Lesueurii, RISSO, Hist. Nat. Eur. Mérid., III, 1829, 281.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 33.—BONAPARTE, Cat. Met., No. 567.—GUICHENOT, Exp. Alger. Poissons, 77.—GÜNTHER, Cat. Fish. Brit. Mus., III, 12.—CANESTRINI, Arch. Zoöl., I, 113, pl. VIII, fig. 2; Pesci d'Italia, 174.—VAILLANT, Exp. Sci. Travailleur et Talisman, 310.—MOREAU, Hist. Nat. Poiss. France, II, 219.

A *Gobius*, with a low first dorsal composed of 6 rays, with orbital diameter greater than width of interorbital space, with 14 rays in second dorsal, and caudal lanceolate and a little longer than head, and with lateral line of about 26–27 scales.

Radial formula: D. VI, I, 14; A. I, 14.

This species, rare in the Mediterranean, where it has occasionally been found near Nice, was obtained by the *Travailleur* off Villefranche, in 445 fathoms. It was also found off the Canaries in 80, and off Morocco in 112 fathoms.

Family CALLIONYMIDÆ.

Callionymini, BONAPARTE, Saggio, etc., 1831.

Callionyminæ, SWAINSON, Nat. Hist. Fish., etc., II, 1839, 183.

Callionymidæ, BONAPARTE, Catalogo Metodico, 1846, 69.—GILL, Arr. Fam. Fish., 1872, 6 (No. 51).

Callionymoidei, BLEEKER, Tentamen, 1859, XXIV.

Callionymina, GÜNTHER, Cat. Fish. Brit. Mus., III, 138.

Gobioid fishes with two separate dorsal fins, and with the ventrals widely separated.

CALLIONYMUS, Linnæus.

Callionymus, LINNÆUS, Systema Naturæ, ed. x, 1758, I, 249 (type, *C. lyra*); ed. XII, I, 433.—GILL, Proc. Acad. Nat. Sci. Phila., 1859, 125.

Gobioids with triangular depressed head, narrow mouth, protractile upper jaw, and gill-opening reduced to a very narrow foramen on the upper surface of the head. Eyes moderate, looking upwards. Teeth minute, absent from palatines. Angle of preoperculum with a strong spine. A single lateral line. First dorsal composed of a very few flexible spines. Ventrals normal, remote. Branchiostegals 6. No air-bladder. Pseudobranchiæ present. Gills 4, with a slit behind the fourth.

"*Callionymus* has been restricted to species with a single lateral line, branchial apertures on the sides of the nape, and perfect ventral fins. The *C. goramensis*, Blkr., may be regarded as a distinct type (*Diplogrammus*), distinguished by the double lateral line. *Synchiropus* and *Dactylopus* are excellent genera, and the last has been adopted under the name *Vulsus*, the change of name having been made on account of the existence of the term *Dactylopoda*, given by Von Meyer to a group of reptiles, as I have been kindly informed by the author of the change. Such extreme views would necessitate very numerous changes in the nomenclature, and are not recognized by naturalists generally." (*Gill.*)

CALLIONYMUS LYRA, LINNÆUS.

Callionymus lyra, LINNÆUS, Systema Naturæ, ed. x, 1758, I, 249; ed. XII, 1766, II, 433.—VAILLANT, Exp. Sci. Travailleur et Talisman, 319.

This well known European form, found along the entire coast of Europe from the German Ocean to the Mediterranean, was obtained by the French expedition in the Gulf of Gascony in 411 meters, off Spain and Portugal in 99 to 240 meters, off Morocco in 112 meters, and near the Canaries in 90 meters.

In addition to the three Atlantic forms named below, the *Challenger* took *C. kaianus*, Günther, in 140 fathoms off the Kai Islands (station 192), *C. calauropomus*, Richardson, from 115 fathoms, near the Philippines (station 204 B).

The *Investigator* took *C. carebares*, Alcock (Ann. and Mag. Nat. Hist., 1889, II, 209, pl. VIII, fig. 8), in the Bay of Bengal (station 96), 98 to 102 fathoms, about 70 specimens.

CALLIONYMUS PHAETON, GÜNTHER.

Callionymus festivus, BONAPARTE, Fauna Italica, Pesci, Fasc. with figures of male and female (not *C. festivus*, Pallas).

Callionymus phaeton, GÜNTHER, Cat. Fish. Brit. Mus., III, 1861, 147.—VAILLANT, Exp. Sci. Travailleur et Talisman, 319.

A. *Callionymus* having the preopercular spine bicuspid and the last dorsal and two middle caudal rays filamentous in the male.

Radial formula: D. IV, 9; A. 8; C. 10.

Color; reddish, variegated with green.

This form, not generally recognized by the Italian ichthyologists, is supposed to occur in the Mediterranean, where Bonaparte obtained the specimen figured by him. Vaillant had specimens from off the Azores, taken in 560 meters by the French Expedition (station CXXIII).

CALLIONYMUS HIMANTOPHORUS, GOODE and BEAN, n. s. (Figures 268, 268, A. B.)

The body is slender, moderately elongate, the fins are all well developed, the tail tapering and with some of its rays produced into a filament. The greatest depth is at the head and the anterior portion of the trunk. The depth of the head equals the length of its postorbital portion and, also, the greatest depth of the body. The caudal peduncle is very slender, the least height of the tail being scarcely more than one-fourth the greatest height of the body. The profile descends very rapidly at the snout. The mouth is small and the intermaxilla is very protractile, but may be almost entirely concealed under the preorbitals. The intermaxilla reaches to the front of the orbit. The maxilla is a roundish, slender bone, extending backward to the end of the intermaxilla. The mandible is about as long as the eye; it extends to the vertical through the front of the pupil. Teeth in villiform bands on the intermaxillary and mandible. The interorbital space is very narrow, less than a fourth of the length of the eye, which is 1½ times as long as the snout and nearly one-eighth of the total without caudal. The length of the head to the gill-opening is two-sevenths of the total without caudal. There is a strong bifurcated spine at the angle of the preoperculum extending backward slightly beyond the gill-opening; the length of this spine at its upper articulation is two-thirds the length of the eye. The gill-opening is reduced to a small slit, placed at a distance behind the eye about equal to the length of the eye and above the median line of the body. Skin naked. The lateral line is abruptly arched over the gill-opening and is connected across the nape with its fellow of the opposite side.

The spinous dorsal is somewhat elevated in front; the first spine is nearly twice as long as the last, its length being about one-fifth of the total length without caudal. The sixth and seventh rays are the longest, their length nearly equaling that of the base of the fin. The caudal consists of four simple and eight divided rays. Of the divided rays in the specimen described the fifth and sixth are the longest, the lower portion of the fifth and the upper portion of the sixth being produced into a filament, making these rays as long as the distance from the tip of the intermaxillary to the fourth anal ray. It is worthy of remark that in another example of the same species and of about the same size as the type the sixth of the divided rays alone contributes to form the filament; and in a young example, one about one-third as large as the type, the first dorsal spine when laid back reaches to the end of the soft dorsal. Some of the numerous examples of this species have none of the caudal rays much produced, even in large individuals. The anal fin begins directly under the third ray of the soft dorsal; its rays increase in length to the sixth, which is the longest and twice as long as the first, its length being contained five and two-thirds times in the total without caudal. All the rays are simple except the last, which is divided. The pectoral begins under the middle of the spinous dorsal and extends to below the fifth ray of the soft dorsal; its rays are all simple. The ventral base overlaps the lower extremity of the pectoral base; its origin is under the gill-opening. The fourth and longest ray equals one-fifth of the total length without caudal. There is a small but distinct anal papilla.

Radial formula: D. IV, 8; A. 8; P. 19; V. I, 5.

Color, generally light brown, the back with numerous narrow streaks and blotches of slightly darker brown. A dark blotch on the membrane between the third and fourth dorsal spines, in some cases occupying nearly all of the membrane; in other cases more limited and nearly elliptical in shape. Anal with a broad subvertical dark band, the tips of the rays and a small area of the membrane behind each ray pale. The lower caudal lobe with a narrow submarginal dark band. Ventral with two indistinct narrow dark bands on its outer half.

Specimens of this species were obtained by the *Blake* from station XXX, off Barbadoes, at a depth of 209 fathoms; station CLXXX, in 24° 17′ 30″ N. lat., 82° 00′ W. lon., at a depth of 137 fathoms; station XXXIII, off Santa Cruz, at a depth of 115 fathoms; station CCXVI, in 20° 31′ N. lat., 85° 03′ W. lon., at a depth of 119 fathoms, and station CCXXX, in 23° 13′ N. lat., 89° 10′ W. lon., at a depth of 84 fathoms.

Additional specimens were secured by the *Albatross* from the following localities: Station 2359, in 20° 19′ 10″ N. lat., 87° 03′ 30″ W. lon., at a depth of 231 fathoms; station 2404, in 28° 44′ N. lat., 85° 16′ W. lon., at a depth of 60 fathoms; station 2314, in 32° 43′ N. lat., 77° 51′ W. lon., at a depth of 159 fathoms; station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms, and station 2406, in 28° 46′ N. lat., 84° 49′ W. lon., at a depth of 26 fathoms.

Family STICHÆIDÆ.

Stichæidæ, GILL, Proc. Acad. Nat. Sc., Phila., 1864, 208.
Stichæidæ, GILL, Can. Nat., 1865, 247, 253; Arr. Fam. Fishes, 1873, 4.
Stichæinæ, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 755.

Blennioid fishes with body low, elongate, and compressed, covered with cycloid scales. Teeth usually well developed, but no molars. Suborbital ring not articulated with preopercle. Dorsal long, continuous, and the entire fin made up of stiff or flexible spines. Anal long, usually with one or two small spines. Ventrals jugular, few rayed. Branchial apertures prolonged forwards and divided by a narrow isthmus. Pseudobranchiæ. Gills 4, with a slit behind the fourth. Vertebræ numerous. Pyloric cæca developed in small number.

This family is chiefly littoral, and only one genus, *Chirolophus*, has been found in any considerable depth.

CHIROLOPHUS, Swainson.

Chirolophus, SWAINSON, *Nat. Hist. Fish*, etc., II, 1839, 275.
Carelophus, KRÖYER, Nat. Tidskr. (2), I, 1844, 236.—STRÖM, Norsk. Vid. Selsk. Skr., 1881, 75.
Blenniops, NILSSON, Skand. Faun. IV, 1853, p. 184.—GÜNTHER, Cat. Fish. Brit. Mus., III, 287; Challenger Report, XXII, 71.

Body moderately elongate, covered with very small scales; lateral line none. Snout short; small teeth in the jaws, none on the palate. Dorsal fin long, formed by spines only. Ventrals very distinct, composed of 1 spine and several rays, distinctly jugular. Caudal distinct. Gill-openings of moderate width, with the gill-membranes connected with each other; pseudobranchiæ present; branchiostegals six; air bladder and pyloric appendages none. (*Günther.*)

CHIROLOPHUS ASCANII, (WALBAUM), GOODE & BEAN.

Blennius Ascanii, WALBAUM, Art. renov., III, 173.
Blenniops Ascanii, GÜNTHER, Cat. Fish. Brit. Mus., III, 284; Ann. Mag. Nat. Hist., 1871, XIII, 139; Challenger Report, XXII, 71.
Carelophus Ascanii, STRÖM, Norsk. Vid. Selsk. Skr., 1881, 75.—COLLETT, Nyt. Mag. f. Naturvid. Christ., XXIII, 1881, 68.

The height of the body is nearly equal to the length of the head, and one-seventh of the total. Snout short, with the cleft of the mouth very oblique. A short tentacle at the nostril; two pairs of fringed tentacles above the orbits, the posterior of which is about three or four times the length of the anterior, and as long as the head is high. Neck with many very small skinny flaps. Ventral fins small; the two anterior spines sometimes elongate, and provided with skinny appendages at the top. Reddish brown, with several cross-bands on the back. (*Günther.*)

This Blenny was obtained during the cruise of the *Porcupine* between Shetland and Faröe, in 180 fathoms, and is recorded by Ström from 140 fathoms in Throndhjem Fjord.

Family ANARRHICHADIDÆ.

Anarrhichini, BONAPARTE, Catalogo Metodico, 1846, 7, 68, (sub fam., 117).
Anarrhichæformes, BLEEKER, Tentamen, 1859, XXV.
Anarrhichadidæ, GILL, Canadian Naturalist, 1865, 247, 252.

Blennioid fishes with molar teeth strong, on vomer, palatines, and sides of lower jaw; dorsal of flexible spines only; scales minute; gill-membranes joined to the isthmus; no ventral fins; air-bladder present; no lateral line.

ANARRHICHAS, Linnæus.

Anarrhichas, ARTEDI, LINNÆUS, Syst. Nat., ed. x, 1758, I, 247 (type, *Anarrhichas lupus*, L.); ed. XII, 1766, II, 430.—GÜNTHER, Cat. Fish. Brit. Mus., III, 208.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 781.—BEAN, Proc. U. S. Nat. Mus., II, 1879, 212.

Body moderately elongate, covered with rudimentary scales; head scaleless, without cirri, compressed, narrowed above, the profile strongly decurved; mouth wide, oblique; premaxillary not protractile; jaws with very strong conical canines anteriorly; lateral teeth of lower jaw either molar or with pointed tubercles; upper jaw without lateral teeth; vomer extremely thick and solid, with 2 series of coarse molar teeth; palatines with 1 or 2 similar series. Gill-membranes broadly joined to the isthmus; no lateral line. Dorsal fin rather high, composed entirely of flexible spines, which are enveloped in the skin; anal fin lower; caudal fin developed, free from dorsal and anal; no ventral fins; pectoral fins broad, placed low; air-bladder present; no pyloric cœca. (*Jordan* and *Gilbert*.)

A key to the species of *Anarrhichas*, prepared by Dr. Bean, is given. In this no reference is made to *A. denticulatus* of Kröyer, because the slight descriptions which we have of this species do not serve to distinguish it from *A. latifrons*. The species known on the American coast as *A. latifrons* is evidently the *latifrons* of Steenstrup[1] and Collett,[2] and we can not see that it differs from *A. denticulatus* of Günther[3] or of Kröyer.[4]

KEY TO THE SPECIES OF ANARRHICHAS.

A. Banded species.
  b. Bluish gray, with 9-12 darker cross-bands. Vomerine teeth extend farther back than the palatine. A. LUPUS
  bb. Greenish, with 14 deep green cross bands; operculum having a green or blue spot; head, back, and sides above mingled bluish and red. Height of body contained about 5½ times in its length. [A. FASCIATUS]

AA. Species without bands.
  c. Spotted (in life).
    d. Many large, round, black spots. Vomerine teeth extend nearly or quite as far back as the palatine .... A. MINOR
  cc. Unicolored.
    e. Brown; D. 81; C. 17; scales none; nostril midway between eye and mouth; head contained 2½ (!) times in total length; 6 canines in upper jaw.. .[A. ORIENTALIS. Pacific]
    ee. Dark brown; vomerine series longer than palatine, and extends farther back; D. 81; C. 20-21; scales few; nostril nearer eye than mouth; head contained 4½-4⅔ times in total length; 4 canines in upper jaw ....[A. LEPTURUS. Alaska]
  dd. Brown, obscurely spotted with darker; vomerine teeth do not extend nearly so far back as the palatine .... A. LATIFRONS

In the measurement tables which follow the hundredths of length are calculated from the total length without the caudal.

ANARRHICHAS LUPUS, LINNÆUS. (Figure 269.)

Anarrhichas lupus, LINNÆUS, Syst. Nat., I, 1766, 430.—DE KAY, Nat. Hist. N. Y., Fishes, 1842, 158, pl. XVI, fig. 43.
Anarrhichas vomerinus, STORER, Hist. Fish. Mass., 1867, 99, pl. XVIII, fig. 1.

This is a banded species, with a general hue of bluish gray, with 9-12 darker cross-bands. The vomerine teeth extend farther back than the palatines.

On the New England coast it is frequent in the deep waters and approaching the shore, particularly in winter. It is associated with many deep-water forms.

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[1] Noget om Slægten Söulv, etc., 1876, p. 43 (Vidensk. Medd. fra den naturhistoriske Forening i Kjöbenhavn, 1876, p. 201, tab. III, figs. 3, 3′, and 3″).

[2] Chra. Vidensk.-Selsk. Forhandl. 1879, No. 1, p. 46, pl. II, fig. 2.

[3] Cat. Fish. Brit. Mus., III, 1861, p. 211.

[4] Gaimard, Voy. en Scand., etc., Zool., Poiss., pl. XII, fig. 1 (no description).

TABLE OF MEASUREMENTS.

Species: *Anarrhichas lupus.*

Current number of specimen	23364 *a*.		23364 *b*.	
Locality	Lat. 42° 50′ N., lon. 65° 50′ W., 85 fathoms.		Lat. 42° 50′ N., lon. 65° 50′ W., 85 fathoms.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length	107	....	123½	....
Length to origin of middle caudal rays	94	....	109	....
Body:				
Greatest height	19	20	22	20
Greatest width	12	12½	13	12
Height at base of pectorals	19	20	22	20
Least height of tail	4	4½	6	5½
Head:				
Greatest length	25	26½	28½	26
Greatest width	13	14	13½	12½
Width of interorbital area	5	5½	5	4.6
Length of snout	4	4½	5	4.6
Teeth	(*)	....	(*)	....
Length of upper jaw	13	14	14	13
Length of mandible	14	15	15	14
Distance from snout to orbit	6½	7	6½	6
Long diameter of eye	8	8½	8	7½
Dorsal:				
Distance from snout	24	25½	24	22
Greatest height	6½	7	8	7½
Length of first ray	6	6⅜	7	6¾
Length of longest ray	10	10⅝	12	11
Anal:				
Distance from snout	53	56⅓	59	54
Length of first ray	3½	4	4	3¼
Length of longest ray	6½	7	8	7½
Caudal:				
Length of middle rays	13	14	14½	13½
Pectoral:				
Distance from snout	24	25½	27	25
Length	17	18	19	17¾
Branchiostegals	VII	....	VII	....
Dorsal	75	....	75	....
Anal	45	....	46	....
Caudal	21	....	21	....
Pectoral	19	....	20	....

* The vomerine series extends farther back than the palatines.

Species: *Anarrhichas lupus.*

Current number of specimen	22240.		17419.		23005.		† 14900.	
Locality	Ipswich Bay, Massachusetts.		Bergen, Norway		Christiania Fjord, Norway. R. Collett.		Coxswains Lodge, July 25, 1874.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length	380	....	570	....	639	....	1110	....
Length to origin of middle caudal rays	345	....	522	....	585	....	1020	....
Body:								
Greatest height	....	19½	....	19	....	21½	....	24½
Greatest width	....	8½	....	9	....	....	....	10½
Height at base of pectorals	....	18	....	18	....	19½	....	21½
Least height of tail	....	5	....	5	....	4½	....	5
Head:								
Greatest length	....	24	....	23	....	22½	....	24½
Distance from nostril to anterior margin of orbit	....	2	....	2½	....	2	....	2
Greatest width	....	13	....	11½	....	10	....	11½
Width of interorbital area	....	3½	....	4½	....	4½	....	6
Length of snout	....	4½	....	5½	....	4½	....	5½
Greatest height	....	17	....	18	....	19	....	20½
Length of upper jaw ‡	....	12	....	11½	....	10½	....	12½
Length of mandible	....	13	....	12½	....	12½	....	14½
Distance from snout to orbit	....	6½	....	7	....	6½	....	6½
Long diameter of eye	....	5	....	3½	....	3½	....	3
Dorsal:								
Distance from snout	....	22	....	21	....	19½	....	21
Greatest height	....	6½	....	....	....	7	....	....
Length of longest ray	....	10	....	12	....	10½	....	12½
Anal:								
Distance from snout	....	50	....	50	....	49½	....	52
Length of first ray	....	5	....	....	....	3	....	4½
Length of longest ray	....	7	....	7½	....	5½	....	6
Lenght of last ray	....	....	....	....	....	3½	....	....
Caudal:								
Length of middle rays	....	10	....	9½	....	9½	....	9
Length of external rays	....	....	....	....	....	8½	....	8½
Pectoral:								
Distance from snout	....	23½	....	22½	....	22	....	*22
Length	....	15	....	15.	....	14½	....	14½
Branchiostegals	....	....	....	....	VI	....	....	....
Dorsal	74	....	73	....	74	....	72	....
Anal	46	....	47	....	48	....	44	....
Caudal	20	....	20	....	20	....	....	....
Pectoral	20	....	20	....	20	....	21	....

* The pectoral extends to the 14th dorsal ray. † These measurements are taken from a cast.

‡ In No. 17419 the vomerine teeth extend farther back than the palatine.

A single small specimen, about 30 millimeters in length, was obtained at station 866, in 65 fathoms, believed to be the young of *Anarrhichas lupus*, never before recorded south of Cape Cod.

ANARRHICHAS MINOR, Olafsen. (Figure 270.)

Anarrhichas minor, Olafsen, Reise i Island, 1772, 683*b*, 592, tab. 42.—Steenstrup, Vidensk. Meddel. Naturh. Foren. Kjobenhavn, 1876.—Bean, Proc. U. S. Nat. Mus., II, 1879, 217.—Collett, Forhandl. Vidensk. Selsk. Christiania, 1880, 45.—Lilljeborg, Sverig. og Norges Fiske, 540.—Günther, Challenger Report, XXII, 1887, 70.

Anarrhichas pantherinus, Zuiew, Nov. Act. Petrop., 1781, 271, tab. *b*.

Anarrhichas karrak, Bonnaterre, Ichthyologie, 1788, 38.

Anarrhichas leopardus, Agassiz, in Spix. Pisc. Bras., 1829, 92, tab. LI.

A species with many large, round, black spots. The vomerine teeth extend nearly or quite as far back as the palatine.

It occurs both along the shores and in the deep water. The Fish Commission has specimens from off the mouth of Gloucester Harbor and from Eastport, Me. It has also been found off Norway at a depth of 200 fathoms.

ANARRHICHAS LATIFRONS, Steenstrup and Hallgrimsson. (Figure 271.)

Anarrhichas latifrons, Stp. and Hallgr., Förh. Skand. Naturf., 3die Möte, 1842, 617.—Collett, Vid. Selsk. Forh., Christiania, 1879, No. 1, 46, pl. II.—Bean, Proc. U. S. Nat. Mus. II, 1879, p. 218.—Lilljeborg, *op. cit.* 540.—Günther, Challenger Report XXII, 1887, 71.

Anarrhichas (*Lycichthys*) *latifrons*, Gill, Baird's Ann. Rec. S. and I. for 1876 (1877), CLXVII.

Anarrhichas denticulatus, Kröyer, Overs. Vidensk. Selsk. Kjöbenhavn, 1844, p. 140.—Gaimard, Voy. en Scand., etc., Zoöl., Poiss., 1845, pl. 12.

A brown form, obscurely spotted with darker patches. The vomerine teeth do not extend nearly so far back as the palatines.

TABLE OF MEASUREMENTS.

Species: *Anarrhichas latifrons*, Stp.

Current number of specimen	Collett's measurements, Chra. Vid Selsk Forh., 1879, No. 1, p. 51.		21845.	
Locality	Oxfjord, West Finmark.		Banquereau.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length	656	....	1108	....
Length to origin of middle caudal rays	608	....	1048	....
Body:				
Greatest height	145	23. 85	255	24. 33
Greatest width	....	....	97	9. 25
Distance of anus from snout	318	....	....	....
Height at anal origin	130	21. 38	239	23
Least height of tail	21	3. 45	44	4. 19
Head:				
Greatest length	120	19. 74	192	18. 32
Greatest width	78	12. 83	116	11. 05
Width of interorbital area	29	4. 78	57	5. 44
Length of snout	34	5. 59	68	6. 49
Length of postorbital part of head	75	....	....	....
Length of upper jaw *	57	9. 37	101	9. 64
Length of mandible	....	....	111	10. 59
Distance from snout to center of orbit	44	7. 24	85	8. 11
Diameter of eye	20	3. 29	27	2. 58
Dorsal:				
Distance from snout	116	19. 08	205	19. 56
Length of base	....	....	875	....
Length of first ray	....	....	22	2. 10
Length of longest ray (63d)	....	....	68	6. 49
Anal:				
Distance from snout	....	....	590	56. 30
Length of base	....	....	455	....
Length of first ray	....	....	20	1. 91
Length of longest ray (38th)	....	....	52	4. 96
Caudal:				
Length of middle rays	48	7. 89	60	5. 73
Length of external rays	....	....	53	5. 06
Pectoral:				
Distance from snout	136	22. 37	220	21
Length	75	12. 34	126	12. 02
Dorsal	77	....	ca. 77	....
Anal	45	....	46	....
Caudal	18	....	17	....
Pectoral	22	....	20	....

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* The palatine series of teeth in No. 21845 extends much farther back than the vomerine and is nearly or quite twice as long as the latter.

A resident of the deep waters in 200 to 400 fathoms on the offshore banks. Many specimens have been received from the halibut schooners, and it has been taken in 100 fathoms off Finmark.

The *Albatross* obtained it from station 2429, in 42° 55′ 30″ N. lat., 50° 51′ W. long., at a depth of 471 fathoms, and the National Museum has a specimen (Cat. No. 21845) taken by one of the Gloucester fishing vessels in 1878 on the fishing-banks.

Family PTILICHTHYIDÆ.

Ptilichthyinæ, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 369 (subfamily of *Mastacembelidæ*).
Ptilichthyidæ, GILL, Standard Nat. Hist., VIII, 1885, 259; Century Dictionary, 4827.

Acanthopterygians with very elongate, anguilliform body, tapering to a point; small head, mouth oblique, with projecting lower jaw; branchial apertures restricted; dorsal very long, with about 90 spines and 145 rays; anal long and ventrals absent. Scales none. Gill-membranes broadly united.

PTILICHTHYS, Bean.

Ptilichthys, BEAN, Proc. U. S. Nat. Mus., IV, 1881, 157 (type, *Ptilichthys Goodei*, BEAN).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 369.

Body elongate, serpentiform, apparently covered with very thin, scattered scales. Mandible little movable, projecting, with a skinny appendage at tip. Cleft of the mouth narrow. Minute teeth in a single series in the jaws, becoming larger and slightly curved posteriorly. Margin of the upper jaw formed entirely by the intermaxillaries. Maxilla curved forward below. The gill-opening extends up to the middle of the base of the pectoral; the membrane is slightly emarginate behind and is free from the isthmus; 4 gills, a slit behind the fourth. Gill-rakers stout and short, moderate in number. Spinous portion of the dorsal consisting of many isolated spines, a narrow membrane behind each. Soft dorsal and anal with many rays. End of the tail free. Ventrals none.

The type species, *Ptilichthys Goodei* (Figure 304), was taken near the Aleutian Islands. Everything seems to indicate that it is an inhabitant of deep water.

Family ZOARCIDÆ.

Zoarchidæ, SWAINSON, Nat. Hist. and Class. Fishes, 1839, II, 184, 283.
Zoarcidæ, GILL, Mem. National Acad. Sci., VI, 1893.
Lycodidæ, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 319.—GILL, Proc. Acad. Nat. Sci., Phila., IV, 319; *op. cit.* 1884, 179.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 783.
Lycodoidæ, GILL, Proc. Acad. Nat. Sci., Phila., 1863, 255.

Physoclystous fishes having body elongate, more or less anguilliform, naked or studded with minute cycloid scales. Head large, unarmed; mouth large, with conical teeth in jaws, and sometimes on vomer and palatines. Gill-membranes broadly united to isthmus, branchial apertures lateral, not confluent; pseudobranchiæ present; gills 4, a slit behind the fourth. Dorsal and anal fins elongate, confluent around the tail, of soft rays only, or the former with a few posterior spines covered with a thick skin; pectorals small; ventrals jugular, rudimentary or suppressed. Lateral line obsolete or nearly so. Gill-rakers small; pyloric cæca rudimentary; vent not close to head.

KEY TO THE SUBFAMILIES AND GENERA OF ZOARCIDÆ.

I. Dorsal fin low behind, some of its posterior rays short and spine-like; ventrals small .... *Zoarcinæ*
A. Scales present; teeth strong, conic, in jaws only .... [ZOARCES]
II. Dorsal fin continuous .... *Lycodinæ*
A. Ventral fins present.
1. Vomer and palatines toothed.
a. Scales present.
I. Body moderately elongate .... LYCODES
II. Body very elongate.
*Spines of vertical fins normal .... LYCENCHELYS
**Spines laterally reënforced .... LYCODONUS

b. Scales absent..LYCODALEPIS
2. Vomer toothless, palatines dentigerous.
a. Scales present, imbedded ....APRODON
3. Vomer and palatines toothless.
a. Scales present...LYCODOPSIS
B. Ventrals absent.
1. Scales present.
a. Vomer and palatines toothed ....[MAYNEA]
b. Vomer and palatines toothless...................................[BOTHROCARA]
2. Scales absent.
a. Teeth moderate.
I. Jaws equal; body scaleless ....GYMNELIS
II. Lower jaw longest.......................................[LYCOCARA = URONECTES]
b. Teeth in jaws and on vomer in a single series, very prominent.
I. Skin loose and movable ....MELANOSTIGMA

LYCODES, Reinhardt.

Lycodes, REINHARDT, Kongl. Danske Selsk. Afhandl., VII, 1838, 117.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 785.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 785.

Zoarceoid fishes with body moderately elongate, anguilliform, tapering behind. Head oblong; mouth nearly horizontal; lower jaw included. Teeth conical on jaws, vomerines, and palatines, those on jaws and palatines usually in single series. Vertical fins united. Origin of dorsal behind base of pectoral; pectorals moderate; ventral rudimentary, of 3 or 4 rays. Scales minute, imbedded, present on part or all of the body, the scaly area more extensive in the adult than in the young. No air bladder nor pyloric caeca.

LYCODES VAHLII, REINHARDT.

Lycodes Vahlii, REINHARDT, Kongelige Danske Videnskabernes Selskabs naturvidenskabelige og mathematiske Afhandl., VII, 1838, 153, tab. V.—GILL, Catalogue of the Fishes of the Eastern Coast of North America, 1861, 46; Proc. Acad. Nat. Sci. Philadelphia, 1863, 260, (Sept.); Catalogue, Fishes of East Coast of North America, 1873, 18.—GÜNTHER, Catalogue of the Fishes in the British Museum, IV, 1862, 319.

Height of body one-eighth of its length. Head nearly twice as long as high, its length four and one-third times in that of body; snout long, the maxillary reaching to opposite middle of eye. Distance of vent from ventrals nearly equal to length of head; ventral fins less than one-fourth as long as pectorals; vertical fins scaly; body wholly scaly.

Radial formula: D. 116; A. 93; V. 4; Vert. 25+87.

Color brownish yellow, with 6 blackish cross bands extending on the dorsal fin and confluent on the belly; the first cross band on and below the anterior dorsal rays, the second above the vent; adults nearly uniform blackish.

This species is as yet known only from Greenland, whence was obtained this type of Reinhardt.

LYCODES ESMARKII, COLLETT. (Fig. 272.)

Lycodes Esmarkii, COLLETT, Norges Fiske, 1874, 95; Norske Nord-Havs. Exp., 1880, 84.
Lycodes Vahlii, GOODE and BEAN, Proc. U. S. Nat. Mus., 1879, 209 (not of Reinhardt).

A *Lycodes* with body moderately elongate, its height one-eighth of its length. Length of head two-ninths that of body; snout obtuse; maxillary not more than half as long as head. Vertical fins, nape and body behind front of dorsal scaly. Lateral line indistinct, divided. Length of pectorals eight times in that of body.

Radial formula: D. 110; A. 95; P. 22; V. 4.

Color brownish black, with a whitish yellow patch on the nape, and 5 to 8 transverse bands of the same color across the dorsal and posteriorly across the anal, these bands becoming broken into annular spots with age.

The U. S. Fish Commission received from Capt. Z. Hawkins and the crew of the schooner *Gwendolen*, of Gloucester, Mass., a fine specimen of a species of *Lycodes*, obtained on La Have Bank, in latitude 42° 43′ N., and between the meridians of 62° 20′ and 63° 30′ W., at a depth of 300 to 400 fathoms, the schooner having changed position while fishing. A second speci men, 632 millimeters in length, was presented by Capt. William H. Greenleaf and the crew of the schooner *Chester R. Lawrence*, who secured it on the Grand Banks.

The dentition of the La Have specimen agrees exactly with that of *L. Verrillii*. The lower jaw has the teeth in two series, with an imperfect series of smaller ones between. The upper jaw has a single series of teeth, with a few smaller ones behind the symphysis. There are about seven teeth on the vomer and a single row of about seven on each palatine. The teeth are obtuse-conic, not curved, as in *L. Verrillii*. In the specimen of *L. Esmarkii* from La Have the colors are somewhat less regular in distribution than those described and figured by Reinhardt; instead of showing 6 light bands, the arrangement of light color upon the dark ground of the body is as follows: One white spot on each side, above the posterior end of the opercular flap, the spots not meeting on the dorsal line. The first saddle-shaped marking begins on the back, under the eighth ray of the dorsal fin, and extends on either side nearly to the middle of the body. The second saddle-shaped marking begins under the twenty-seventh dorsal ray and extends nearly to the margin of the fin, involving the width of about two rays and the connecting membrane, and extends also downward nearly to the middle line of the body, increasing in width as it descends. The next begins under the fifty-fourth ray, and resembles the last in form and extent. The next begins under the seventy-ninth, and, though smaller, resembles the others. The individual from the Grand Banks is the largest yet recorded. The measurements are as follows:

TABLE OF MEASUREMENTS.

Current number of specimen Locality	22,491. Grand Banks.		21,991. La Have Bank.		Measurements of type given by Reinhardt.*		Collett's measurements of a type specimen.†	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Danish inches.	100ths of length.	Millimeters.	100ths of length.
Extreme length	632		540		18		300	
Body:								
Greatest height		13		11		10		
Greatest width		9		11		8		
Width at vent				7		5½		
Height at ventrals		10½						
Height at vent		12		13		7½		
Snout to middle of vent				39		40		43
Head:								
Greatest length		21½		20½		21		20½
Distance from snout to nape		14½						
Width over eyes				9½		10½		
Greatest width over cheeks		9½		10½		12½		
Greatest height over cheeks				10		9		10
Width of interorbital area		4½						3½
Height over eyes				9		6½		
Length of snout		7		6				6
Length of operculum		5½		5½				
Length of postorbital portion of head				10½				10½
Length of maxillary		9½		9				
Length of mandible		10½		9½		11		
Distance from snout to orbit		7½						
Distance from snout to middle of pupil				8½		·9		
Long diameter of eye		2		3½		ca. 4		4
Dorsal:								
Distance from snout		24		24½		26½		26½
Length of first ray						3		
Length of eleventh ray				5		5		
Length of twenty-fourth ray				5½		6½		
Length of fifty-fourth ray				5½		6		
Length of ninety-third ray				5½		5½		
Length of ray at end of tail				2½		2		
Length of longest ray		6½		5½		6½		
Anal:								
Distance from snout		41		42				
Length of first ray				2½		4½		
Length of twenty-fourth ray				4½		5½		
Length of sixty-fourth ray				6		5½		
Length of eighty-fifth ray				3½		3		
Length of longest ray		4½		6		5½		
Pectoral:								
Distance from snout		21½		20		22		
Distance of tip from snout				32		33½		
Length		12		12		11½		14
Ventral:								
Distance from snout		18		10		18		16
Length		2		8		2½		1½
Branchiostegals	5							
Dorsal			110		116-117			
Anal			97		91-93, 95			
Pectoral	23		20		19-20			
Ventral	3		3					

* Dansk. Vid. Selsk. naturvid. og math. Afh., Deel vii, 1838, 153, pl. v.

† Norges Fiske, 1875, 90.

Examples were also obtained by the *Albatross* from station 2470, in 44° 47′ N. lat., 66° 33′ 45″ W. long., at a depth of 224 fathoms; and from station 2187, in 39° 49′ 30″ N. lat., 71° 10′ W. long., at a depth of 420 fathoms; and by the *Fish Hawk* (Cat. No. 28920, U. S. N. M.) from station 998, in 39° 43′ N. lat., 71° 42′ W. long., at a depth of 302 fathoms.

LYCODES RETICULATUS, REINHARDT. (Figures 273, 281, A, B.)

Lycodes reticulatus, REINHARDT, *loc. cit.*, 167.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 320.—GILL, *loc. cit.*, 260.—COLLETT, *loc. cit.*, 84.

Lycodes Rossi, MALMGREN, 1864. (Specimens from Spelzbergen; *fide* Collett.)

Lycodes gracilis, SARS, Forhandl. Vid. Selsk. Christ., 1867, 40–45, tab. I, figs. 1-3 (from Dröbak).

Lycodes perspicillum, KRÖYER, Dansk. Vidensk. Selsk. Afhandl., 1845, 233.—GÜNTHER, *loc. cit.*, 320.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 260.

Body moderately elongate; its height about one-eighth of its length. Length of head twice the height of the body; snout long; the maxillary extending beyond vertical from middle of eye; distance of vent from ventrals more than length of head. Body entirely covered with scales; vertical fins naked.

Radial formula: D. 94; A. 75; V. 4; Pyl. cæc., 2.

Color, brownish, with a network of black lines on head and body; those on the body in five groups, the three anterior of which are partly visible on the dorsal fin; dorsal dark-edged.

The *Albatross* obtained specimens from station 2453, in 47° 10′ N. lat., 51° 02′ W. lon., at a depth of 82 fathoms; from station 2452, in 47° 04′ N. lat., 58° 48′ W. lon., at a depth of 89 fathoms; and from station 2652, in 24° 12′ 30″ N. lat., 77° 13′ W. lon., at a depth of 140 fathoms; and the *Fish Hawk* (Cat. No. 26357, U. S. N. M., and Cat. No. 26358, U. S. Nat. Mus.), from station 861, in Vineyard Sound, Narragansett Bay, in 17 fathoms.

LYCODES FRIGIDUS, COLLETT. (Figure 274.)

Lycodes frigidus, COLLETT, Forh. Selsk. Christ., 1878, Nos. 11, 15.

Color in adults, uniform gray-violet without bands or spots. Size large, reaching 500 millimeters and upward. Scales comparatively small, covering the entire body, but not the head, nor the base of dorsal and anal; in the young the middle of the belly, the base of the fins, and the fins themselves are usually naked. Teeth present on the intermaxilla and mandible, the palatines and vomer. In adults the height of the body is contained 6½ times, in the young as many as 9½ times in the total length. The head is wide and flat, its length contained from 4 to 4½ times in the total length. Lateral line low, extending from the upper end of the gill-opening in a curved direction down toward the vent, from where it runs close along the anal to the end of the tail.

B. 5; D. 93–98, (including one-half of caudal, 99–104); A. 80–85 (including one-half of caudal, 85–90); P. 20–21; V. 3. (Collett, *loc. cit.*)

The *Albatross* obtained specimens from station 2110, in 35° 12′ 10″ N. lat., 74° 57′ 15″ W. lon., at a depth of 516 fathoms; from station 2530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; from station 2115, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., at a depth of 843 fathoms; from station 2116, in 35° 45′ 23″ N. lat., 74° 31′ 25″ W. lon., at a depth of 888 fathoms; from station 2209, in 39° 34′ 45″ N. lat., 71° 31″ 30″ W. lon., at a depth of 1,080 fathoms; from station 2530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; from station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms; Cat. No. 33429, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 838 fathoms; Cat. No. 35582, U. S. N. M., from station 2106, in 39° 35′ N. lat., 71° 24′ 30″ W. lon., at a depth of 1,043 fathoms; Cat. Nos. 35569, 35571, and 35574, U. S. N. M., from station 2203, in 39° 34′ 15″ W. lon., at a depth of 705 fathoms; Cat. No. 35438, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; Cat. No. 35439, U. S. N. M., from station 2182, in 39° 25′ 30″ N. lat., 71° 44, W. lon., at a depth of 861 fathoms; Cat. No. 35582, U. S. N. M., from station 2115, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., at a depth of 843 fathoms; Cat. No. 35552, U. S. N. M., from station 2216, in 39° 47′ N. lat., 70° 30′ 30″ W. lon., at a depth of 963 fathoms; Cat. No.

35628, U. S. N. M., from station 2229, in 37° 38′ 40″ N. lat., 73° 16′ 30″ W. lon., at a depth of 1,423 fathoms; Cat. No. 33309, U. S. N. M., from station 2052, in 39° 40′ 05″ N. lat., 69° 21′ 25″ W. lon., at a depth of 1,098 fathoms; Cat. No. 33521, U. S. N. M., from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1,022 fathoms; Cat. No. 32813, U. S. N. M., from station 2018, in 37° 12′ 22″ N. lat., 74° 20′ 04″ W. lon., at a depth of 788 fathoms; Cat. No. 33304, U. S. N. M., from station 2051, in 39° 41′ N. lat., 69° 20′ 20″ W. lon., at a depth of 1,105 fathoms; Cat. No. 35531, U. S. N. M., from station 2208, in 39° 33′ N. lat., 71° 16′ 15″ W. lon., at a depth of 1,178 fathoms; Cat. No. 35658, U. S. N. M., from station 2234, in 39° 09′ N. lat., 72° 03′ 15″ W. lon., at a depth of 816 fathoms.

LYCODES MUCOSUS, RICHARDSON. (Figures 275, 283, A. B.)

Lycodes mucosus, RICHARDSON, Last of Arctic Voyages, 1855, 326; pl. XXVI.—BEAN, Bull. XV, U. S. Nat. Mus., 112.

The greatest height of the body (at the pectorals) is contained 8 times and its greatest width (just behind the pectorals) 9 times in the total length. The width at the vent is contained 8 times in the length of the head and twice in the length of the longest dorsal ray. The height at the ventrals about equals the height of the body at the pectorals. The height of the body at the vent equals half the greatest width of the head, and is contained 11½ times in the total length.

The head is very large, its length being $\frac{7}{25}$ of the total, and its greatest width contained 5¾ times in the whole length. The distance from the tip of the snout to the nape is one-fifth of total length, and four-thirds of the length of the mandible. The distance between the eyes is contained 6 times in the length of the head. The length of the snout is one-third of the length of the head. The nostrils are much farther from the eyes than from each other, their distance from the eyes being contained 4⅓ times in the length of the head. The length of the upper jaw is contained 6¼ times in the total length; of the lower jaw, 6¾ times; the upper jaw slightly exceeding the mandible in length. The eyes are very small, close together, and high, their long diameter being equal to one-eleventh of the length of the head.

The distance from the tip of the snout to the beginning of the dorsal fin is contained 3¼ times in the total length. The first ray of the dorsal is contained 5¾ times in the length of the head, and the longest, 4 times.

The distance of the anal from the snout is eleven-twentieths of the total length and almost equals twice the distance of the pectoral from the snout. The first anal ray is contained 9⅛ times in the length of the head, the longest 4⅛ times. The vent is nearly in the middle of the total length.

The distance from the tip of the snout to the base of the pectoral is contained 3½ times, and the length of the pectoral 6⅝ times in total length. The length of the pectoral equals that of the mandible, and only slightly exceeds one-half of the length of the head.

The distance of the ventral from the tip of the snout equals the length of the head. The length of the ventral equals the long diameter of the eye.

Radial formula: D. (including half of caudal) 90; A. (including half of caudal) 71; P. 18; V. 3.

Colors: These agree, in the main, so closely with Richardson's description of them, that it is unnecessary to say more than that the cross-markings are faint and narrow.

The gape of the mouth is very wide. The character and arrangement of the teeth agree perfectly with the original description.

A single individual, 17 inches long, of this species, originally described from Northumberland Sound, was found by Lieut. Mintzer, and presented by him to the U. S. National Museum.

LYCODES PALLIDUS, COLLETT.

Lycodes pallidus, COLLETT, Forh. Selsk. Christ., 1878, No. 14, 70.

Color (in young examples) pale yellowish gray-brown, with a series (5–6) of dark vertical stripes on the dorsal, and a longer stripe toward the end of the anal. Scales comparatively large, covering the body up to about the base of the pectoral, while the head, nape, fins, and the middle of the belly are naked. Teeth present on the intermaxilla, palatines, and vomer. Height of body contained 9½ times, and head nearly 4½ times in the total length (in young individuals). The lateral line runs downward from the upper angle of the gill-opening in a curve under the median line of the body to about the vent, where it ceases or becomes inconspicuous.

B. 5; D. 92–95 (with one-half of caudal, 98–101); A. 79–81 (with one-half of caudal, 84–86); P. 18–19.

Two young examples were taken in the middle of August off the north coast of Spitzbergen, in about 80° north latitude. The first was obtained August 14, from a depth of 459 fathoms at station 362, about 15 miles west of Norsköerne; bottom temperature,—1° C.; the bottom consisted of bluish-gray clay. This individual was a little over 6 inches long. The second, which was a young individual, 3½ inches long, was collected on the same day at station 363, about 8 miles west of Norsköerne, in a depth of 260 fathoms. The bottom temperature was +1.2° C.; the bottom consisted of blue clay.

	a.	b.
	Millimeters.	*Millimeters.*
Total length	93	164
Length to base of caudal	90	161
Height at dorsal origin	10	17
Height at anal origin	9	15
Tip of snout from dorsal origin	25	46
Tip of snout from vent	37	64
Vent to base of caudal	56	100
Length of head	21	37
Snout (to origin of iris)	7	13
Long diameter of eye	4	7
Post-orbital part of head	10	17
Tip of lower jaw from ventral	16	27
Ventral from vent	19	34
Length of ventral	3	4
Length of pectoral	13	17

The lateral line begins at the upper angle of the gill-opening, makes a slight curve over the opercular flap, and thence proceeds in a curve, without any straight portion, about down to the vent; from here, in the two specimens, it is inconspicuous, but can be partially traced along the anal base toward the base of the caudal. The number of pores to the vent is about 34. (*Collett, loc. cit.*)

LYCODES PERSPICILLUM, KRÖYER. (Figures 278; 278 A, young.)

Lycodes perspicillum, KRÖYER, Dansk. Vidensk. Selsk. Afhandl., XI, 1845.

Distinguished by a light body color and dark bands, also two ocellated spots on the forehead, which have suggested the specific name. Still further separated from the previously known species of *Lycodes* by the smaller number of fin rays, larger eye, etc. (*Kröyer.*)

Specimens were obtained by the *Albatross* from station 2491, in 45° 24′ 30″ N. lat., 58° 35′ 15″ W. lon., at a depth of 59 fathoms, and from station 2456, in 47° 29′ N. lat., 52° 18′ W. lon., at a depth of 86 fathoms.

LYCODES SEMINUDUS, REINHARDT.

Lycodes seminudus, REINHARDT, Kong. Dansk. Selsk., etc., 1838, 223.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 320.—GILL, *loc. cit.*, 260.—COLLETT, *loc. cit.*, 113.

Body moderately elongate; its height, which is half the length of the head, one-seventh of its length. Body naked in front of vent, scaly behind; fins naked. Ventrals distant from vent somewhat more than length of head.

Radial formula: D. 91; A. 74; P. 21.

Color, uniform pale grayish brown, without spots or bands.

This species is known only from Omenak, Greenland, but is likely to occur in deep water.

LYCODES SARSII, COLLETT.

Lycodes Sarsii, COLLETT, Forh. Selsk. Christ., 1871, 62–66, with a plate.

A *Lycodes* with the body moderately elongate; its height, which is more than half the length of the head, about one-tenth of the total length; length of the head about 5½ times in that of the body; length of the maxillary less than the length of the head. Upper and lower jaw with a series of round pores, uniting at the angle of the mouth, and continuing backward over the operculum to the branchial aperture. Diameter of the orbit less than the length of the snout, more than one-fifth the length of the head, and twice the width of the interorbital space. Origin of dorsal fin nearer to the vent than to the origin of the pectorals. Ventrals short, of 3 rays, the longest slightly more than one-fourth the length of the pectorals. Pectorals lanceolate, their length somewhat less than that of head. Distance from vent to ventrals somewhat less than length of head. Scales lacking.

Radial formula: P. 18; V. 3.

Color, brown above, yellowish below.

The type, 44 millimeters long, was obtained in the Hardanger Fiord, Norway, at a depth of 100–150 fathoms, in September, 1869, by Prof. Sars. The specimen was immature.

LYCODES ZOARCHUS, GOODE and BEAN, n. s. (Figures 276, 276 A (young), 283 C).

The greatest height of the body, 40 millimeters, is about one-ninth of the total length; it is entirely covered with conspicuous imbedded scales which extend behind the dorsal and anal, leaving only a narrow, naked margin around these fins. Head and pectorals naked. A lateral line begins slightly above the upper angle of the gill-opening, rapidly curving downward and extending along the lower part of the body not far from the base of the anal fin; it can be traced above the anterior two-thirds of the anal.

The length of the head, 66 millimeters, is contained nearly 5⅗ times in the total. Its greatest height, 32 millimeters, equals about one-half its length. The interorbital distance, measured on the bone, is only one-fourth of the length of the eye. The length of the eye, 15 millimeters, is nearly one-fourth the length of the head and is equal to the length of the snout. The nostrils are placed close to the upper lip and as far from each other as from the eye. The maxilla reaches to the vertical through the middle of the eye.

The length of the upper jaw, 28 millimeters, is contained 2⅓ times in that of the head. The length of the mandible, 31 millimeters, is nearly one-half that of the head. The mandible has a conspicuous flap on each side, about as long as the eye, beginning at a distance from the symphysis equal to one-half the length of the eye. The inner edge of the mandible also has a slightly elevated ridge of skin. Length of intermaxillary series of teeth, 13 millimeters, equal to one-fifth of that of the head. Length of palatine series, 12 millimeters, nearly equal to that of intermaxillary. Vomerines in a round patch. Mandibular teeth in three series. Width of gill-opening, 25 millimeters, two-fifths length of head. The ventrals are in front of the base of the pectorals; their length, 8 millimeters, equals one-eighth that of the head. The distance between the lower angles of the gill-opening, 12 millimeters, is nearly one-fifth the length of the head. The origin of the dorsal is distant from the head a space equal to one-third the length of the head; it is slightly behind the middle of the pectoral. The pectoral when extended reaches to about the vertical from the sixth dorsal ray. The longest ray of the dorsal is about one fourth the length of the head. The anal orginates under the seventeenth ray of the dorsal. The vent is under the fifteenth ray of the dorsal. The longest pectoral ray, 38 millimeters, is contained about 9⅓ times in the total length.

Color, grayish-brown, lighter on the belly and under surface of the head; sides, irregularly mottled with darker, a narrow dark edge at the tip of the first four dorsal rays.

In a young specimen, No. 39299, the mottlings on the sides are band-like, the bands not extending below the middle of the body entirely. This example is from N. lat. 44° 26′, W. lon. 57° 11′ 15″, 190 fathoms.

D. 116; A. 102; P. 19.

The type of the description is a specimen 366 millimeters long, catalogue number 39298, obtained by the *Albatross* in N. lat. 44° 46′ 30″, W. lon. 59° 55′ 45″, 130 fathoms, off Nova Scotia. This species has the same number of rays in the dorsal and anal as in some specimens of *L. paxillus*, but the pectoral has 19 rays instead of 16, the median lateral line is not developed as in *paxillus*, and the form is very much stouter, the greatest height in *paxillus* being only a fifteenth of the total length, while in *zoarchus* it is one-ninth. The head in *paxillus* is one-seventh of the total length, while in this species its length is contained 5⅜ times. The coloration is also very different from that of *paxillus*, the latter being a uniform brown, while *zoarchus* has a black blotch at the beginning of the dorsal, and the sides are irregularly mottled with dark markings, which in the young specimen form more or less complete bands, while in adult specimens these bands break up into irregular mottlings.

LYCENCHELYS, Gill.

Lycenchelys, GILL, Proc. Acad. Nat. Sci., Phila., 1884, 180.

A genus closely allied to *Lycodes*, but having a very elongate body, its length being from twelve to twenty-four times its height.

LYCENCHELYS MURÆNA, (COLLETT), GILL.

Lycodes muræna, COLLETT, Forh. Selsk. Christ., 1878, No. 14, 15.
Lycenchelys muræna, GILL, *loc. cit.*

A *Lycenchelys* with body extremely elongate and slender; its greatest height contained about 20 times, length of head nearly 8 times in the total length. The long diameter of the eye is contained about 4½ times in the length of the head. Body everywhere scaled, head and fins naked. Ventrals comparatively close together, contained 6 times in the length of the pectoral. Teeth in a single series in both jaws. Color (in the single young individual examined) uniform grayish brown.

D. 112 (including one-half of caudal, 118); A. 95 (including one-half of caudal, 101); P. 13.

	Millimeters.		Millimeters.
Total length	141	Long diameter of eye	4
Length of head	18	Vertical diameter of eye	3
Greatest height of body	7	Post orbital part of head	9
Tip of snout from vent	39	Length of intermaxilla	7
Tip of snout from ventrals	15	Greatest depth of head	8
Tip of snout from dorsal	21	Width of head over cheeks	8.5
Length of snout	5	Length of pectoral	12

Lateral line present, but difficult to trace in its entirety. From the upper angle of the gill-opening a series of rather closely placed, very small pores (connected by a narrow line), descends in a curve to a short distance behind the vent; after having reached nearly to the base of the anal, it runs for a short distance nearly horizontally, whereupon it ceases, or can not be followed in the same direction with certainty. Another lateral line, however, begins about over the vent, and runs horizontally along the median line, becoming obsolete toward the end of the tail. The pores herein are very small and more widely separated, and can be seen only by close observation; the short whitish line which runs through each pore, forms here no accompanying line.

Since the termination of the anterior descending lateral line is considerably behind the origin of the upper horizontal lateral line, no connection appears to exist between them. (*Collett.*)

One example, about 7 inches long, from the bank off Trænen, in Helgeland, Norway; ice-cold water.

A, station 124, 66° 41′ N. lat., 6° 59′ E. lon. Depth, 350 fathoms, temperature, 0.8° C., bottom, clay. June 19, 1877.

LYCENCHELYS VERRILLII, (GOODE and BEAN), Jordan. (Figures 277, 277 A, Young.)

Lycodes Verrillii, GOODE and BEAN, Amer. Jour. Sci. and Arts, XVI, 1877, 474; Cat. Fish., Essex Co. and Mass. Bay, 1879, 9.—GOODE, Proc. U. S. Nat. Mus., III, 337, 477.
Lycenchelys Verrillii, JORDAN, Cat. Fish. N. Amer., 1885, 124.

Body very elongate, its height 12–13 in its length. Head much depressed, its length 5⅜ in that of the body; maxillary nearly reaching posterior margin of orbit; upper jaw much the longer; profile very convex; snout obtusely rounded above.

Radial formula: D. 92; A. 88.

Color, light grayish brown above; below, pearly white; sides with irregular brown patches bisected by the lateral line; abdominal region livid blue; a spot of brown on the tip of the tail.

L. Verrillii proves, as we have long believed it to be, a pygmy species, reaching maturity at a length of from 5 to 6 inches. The old males are transformed almost beyond specific recognition by an extraordinary development of the entire head in advance of the eyes. The snout becomes shovel-shaped, its length equal to two-fifths that of the head, while in the normal condition it is only one-fourth. We have examined specimens in intermediate condition. The extension of the snout is accompanied by a corresponding enlargement of the muscles of the cheeks.

The *Blake* secured examples from station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; from station CCCXXIX, in 34° 39′ 40″ N. lat., 75° 14′ 40″ W. lon., at a depth of 603 fathoms, and from station CCCXXXII, in 35° 45′ 30″ N. lat., 74° 48′ W. lon., at a depth of 263 fathoms. The *Albatross* obtained specimens from station 2547, in 39° 54′ 30″ N. lat., 70° 20′ W. lon., at a depth of 390 fathoms; from station 2299, in 35° 40′ N. lat., 74° 51′ 30″ W. lon., at a depth of 296 fathoms; Cat. No. 35563, U. S. N. M., from station 2212, in 39° 59′ 30″ N. lat., 70° 30′ 45″ W. lon, at a depth of 428 fathoms; Cat. No. 35462, U. S. N. M., from station 2187, in 39° 49′ 30″ N. lat., 71° 10′ W. lon., at a depth of 420 fathoms, and Cat. No. 35695, U. S. N. M., from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms. The *Fish Hawk* took it from station 870, in 40° 02′ 36″ N. lat., 70° 22′ 58″ W. lon., at a depth of 155 fathoms; from station 880, in 39° 48′ 30″ N. lat., 70° 52′ W. lon., at a depth of 252½ fathoms; Cat. No. 28894, U. S. N. M., from station 987, in 89° 42′ N. lat., 71° 32′ W. lon., at a depth of 335 fathoms; Cat. No. 28904, U. S. N. M., from station 1025, in 39° 49′ N. lat., 71° 25′ W. lon., at a depth of 216 fathoms; Cat. Nos. 28919 and 28923, U. S. N. M., from station 998, in 39° 43′ N. lat., 71° 32′ W. lon., at a depth of 302 fathoms; Cat. Nos. 26730 and 26738, U. S. N. M., from station 898, in 37° 24′ N. lat., 74° 17′ W. lon., at a depth of 300 fathoms; Cat. No. 28886, U. S. N. M., from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; Cat. No. 28959, U. S. N. M., from station 1032, in 39° 56′ N. lat., 69° 22′ W. lon., at a depth of 208 fathoms; Cat. No. 28736, U. S. N. M., from station 925, in 39° 55′, N. lat., 70° 47′ W. lon., at a depth of 229 fathoms; Cat. No. 29074, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; Cat. No. 28928, U. S. N. M., from station 1028, in 39° 57′ N. lat., 69° 17′ W. lon., at a depth of 410 fathoms; Cat. No. 26180, U. S. N. M., from between 39° 52′ 20″ N. lat., 70° 58′ W. lon., and 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., in from 238 to 372 fathoms; Cat. No. 28800, U. S. N. M., from station 946, in 39° 55′ 30″ N. lat., 71° 14′ W. lon., at a depth of 247 fathoms; Cat. No. 28797, U. S. N. M., from station 947, in 30° 53′ 30″ N. lat., 71° 13′ 30″ W. lon., at a depth of 319 fathoms; Cat. No. 31586, U. S. N. M., from station 992, in 40° 33′ N. lat., 70° 45′ W. lon., at a depth of 36 fathoms; Cat. Nos. 26082 and 26093, U. S. N. M., from station 880, in 39° 48′ 30″ N. lat., 70° 52′ W. lon., at a depth of 252½ fathoms; Cat. No. 28902, U. S. N. M., from station 999, in 39° 45′ 13″ N. lat., 71° 30′ W. lon., at a depth of 266 fathoms; Cat. No. 31532, U. S. N. M., from station 1090, off Cape Cod, at a depth of 110 fathoms; Cat. No. 31759, U. S. N. M., from station 1142, in 39° 32′ N. lat., 72° W. lon., at a depth of 322 fathoms; Cat. No. 26160, U. S. N. M., from station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms; Cat. No. 31597, U. S. N. M., from station 1092, in 39° 58′ N. lat., 69° 42′ W. lon., at a depth of 202 fathoms; Cat. No. 28768, U. S. N. M., from station 938, in 39° 51′ N. lat., 69° 49′ 15″ W. lon., at a depth of 317 fathoms; Cat. No. 26096, U. S. N. M., from station 879, in 39° 49′ 30″ N. lat., 70° 54′ W. lon., at a depth of 225 fathoms, and Cat. No. 26080, U. S. N. M., from station 881, in 39° 46′ 30″ N. lat., 70° 54′ W. lon., at a depth of 325 fathoms. Several individuals were taken by the *Speedwell* from station 172, in 42° 33′ N. lat., 69° 57′ W. lon., at a depth of 115 fathoms; from station 199, off Thatcher's Island, at a depth of 98 fathoms; from station 194, at a depth of 110 fathoms, and from station 164, off Thatcher's Island, in 75 fathoms.

LYCENCHELYS PAXILLUS, (GOODE and BEAN) Jordan. (Figures 279; 282.)

Lycodes paxillus, GOODE and BEAN, Proc. U. S. Nat. Mus., II, 1879, 44; Cat. Fish. Essex Co. and Mass. Bay, 1879, 9.—GOODE, Proc. U. S. Nat. Mus. III, 477 (a kipper male).

Lycenchelys paxillus, JORDAN, Cat. Fish. N. Amer., 1885, 124.

Lycodes paxilloides, GOODE and BEAN, Bull. Mus. Comp. Zool., 1883, X, No. 5, 207-8 (a normal, not sexually distorted, individual).

Body attenuate, its greatest height about half the length of the head, which is broad flat above, with declivous profile; its length contained about eight times in that of body. Upper jaw extending far beyond the lower; cheeks very full and protuberant. Teeth stout, recurved, and sharply pointed, in a single series on both jaws, except at the symphysis; a few teeth clustered at the head of the vomer; palatines with a single series; interorbital space about one-fourth length of snout, which is about equal to that of eye, which is contained 3½ times in length of head. The tubular nostril is much nearer to the tip of the snout than to the eye.

Origin of dorsal over end of the extended pectoral; its distance from the tip of the snout is contained 4 to 4⅔ times in the total length; that of the anal from the snout 3¼ times or less. Vent immediately in front of anal. The length of the pectoral equals one-half that of the head, or a little more. The distance of the ventral from the snout is contained 8½ times in the total length. The length of the ventral is scarcely more than that of the pupil. Scales very small, present everywhere except on the head and pectorals, extending almost out to the margin of the vertical fins.

Radial formula: D. 116; A. 100.

Color, light brown, the head somewhat darker.

The form of *L. paxillus* is rounder and more terete than that of almost any other described species. It is also easily distinguished by its very short head, by the peculiar curvature of the strong jaw, and by the enormous development of the muscles of the cheek. In the small number of pectoral rays it resembles *L. polaris*, Sabine, *L. muræna*, Collett, and *L. Verrillii*, Goode and Bean.

The type of *L. paxillus* is a male in breeding form, such as is shown in figure 279.

L. paxilloides was based upon a normal individual, as shown in figure 282.

The first example of this form was obtained by Capt. Joseph W. Collins and the crew of the schooner *Marion* of Gloucester, from the gully between Le Have and Sable Island Banks, in lat. 42° 48′ N., lon. 63° 07′ W., and presented to the U. S. Fish Commission for the National Museum. The specimen, which is 11⅞ inches in length, is in a dilapidated condition, and was apparently taken from the stomach of a fish, probably a halibut. Fishing in this locality is carried on exclusively with trawls or long-lines at a depth of 1,200 to 2,400 feet.

The *Blake* secured specimens from station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; from station CCCXII, in 39° 50′ 45″ N. lat., 70° 11′ W. lon., at a depth of 466 fathoms; and from station CCCXXXII. in 35° 45′ 30″ N. lat., 74° 48′ W. lon., at a depth of 263 fathoms; the *Albatross* from station 2561, in 39° 38′ N. lat., 71° 42′ W. lon., at a depth of 500 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; Cat. No. 35406, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; Cat. No. 33372, U. S. N. M., from station 2078, in 41° 11′ 30″ N. lat., 66° 12′ 20″ W. lon., at a depth of 499 fathoms; Cat. No. 35544, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; Cat. No. 35663, U. S. N. M., from station 2238, in 39° 06′ N. lat., 72° 10′ W. lon., at a depth of 904 fathoms; Cat. No. 35545, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; Cat. No. 35629, U. S. N. M., from station 2233, in 38° 36′ 30″ N. lat., 73° 06′ W. lon., at a depth of 630 fathoms; and Cat. No. 35612, U. S. N. M., from station 2201, in 39° 39′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms. Examples were also obtained by the *Fish Hawk* as follows: Cat. No. 26181, U. S. N. M., from station 891, in 39° 46′ N. lat., 71° 10′ W. lon., at a depth of 480(?) fathoms, and station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms; Cat. No. 31766, U. S.

N. M., from station 1143, in 39° 29′ N. lat., 72° 01′ W. lon., at a depth of 452 fathoms; Cat. No. 29076, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; Cat. No. 31763, U. S. N. M., from station 1140, in 39° 34′ N. lat., 71° 56′ W. lon. at depth of 374 fathoms; Cat. No. 28760, U. S. N. M., from station 937, in 39° 49′ 25′ N. lat. 69° 49′ W. lon., at a depth of 506 fathoms; Cat. No. 28929, U. S. N. M., from station 1028, in 39° 57′ N. lat., 69° 17′ W. lon., at a depth of 410 fathoms, and Cat. No. 28953, U. S. N. M., from station 1029, in 39° 57′ 06″ N. lat., 69° 16′ W. lon., at a depth of 458 fathoms.

LYCODONUS, Goode and Bean.

Lycodonus, GOODE and BEAN, Bull. Mus. Comp. Zool., x, No. 5, 208.—GÜNTHER, Challenger Report, XXII, 1887, 81.

Lycodoids with body blenniform, elongate. Scales small, circular, imbedded in the skin. Lateral line very short, posteriorly obsolete. Eye moderate. Jaws without fringes. Upper jaw longer than lower. Fin rays soft, articulated; those of the dorsal and anal fins supported laterally, each by a pair of sculptured ectodermal scutes or plates. Caudal distinct, not fully connate with dorsal and anal, few-rayed. Ventrals present, jugular, each composed of a few slender, deeply cleft, articulated rays. Gill opening rather narrow. Branchiostegal membranes broadly joined to the isthmus. Teeth as in *Lycodes*. Pseudobranchiæ apparently present. Branchiostegals apparently 5. Gill arches 4. Gill-rakers rudimentary, in moderate number. Air bladder and pyloric cæca apparently absent.

This genus is in nearly every particular like *Lycodes*, from which, however, it is distinguished by the peculiar structure of the dorsal and anal fins.

LYCODONUS MIRABILIS, GOODE and BEAN. (Figure 280.)

Lycodonus mirabilis, GOODE and BEAN, Bull. Mus. Comp. Zool., 1883, x, No. 5, 208, 209.

The body is shaped much as in *Lycenchelys Verrillii;* its greatest height, at origin of dorsal, contained about 18 times in the length of the body. Scales as in *Lycodes*, the scales not extending out upon the fins. The head and nape are also scaleless. Lateral line apparently obsolete posteriorly, not extending back of the extremity of the pectoral.

The length of the head is contained about 7 times in the entire length. The diameter of the eye is contained 2½ times in the length of the head, and is about equal to the postorbital portion of the head. The eye is placed high, the width of the interorbital space being less than the diameter of the pupil, and contained 3½ times in the long diameter of the eye. Nostrils immediately in front of the eye. The maxilla extends to the vertical through the anterior margin of the pupil; the mandible, to a little behind the vertical through the posterior margin of the pupil.

The dorsal fin is inserted slightly behind the vertical through the base of the pectoral; the portion of the fin present in the mutilated specimen before us contains 80 articulated rays. The first 10 or 11 scutes do not support rays, but whether rays were originally present or not can not be ascertained. The longest dorsal ray is about equal to the longest anal ray, its length being contained about 3 times in that of the head. The distance of the vent from the snout is twice the length of the head; the anal begins immediately behind the vent; it consists at present of about 70 articulated rays. The caudal rays extend beyond the tips of the ultimate dorsal and anal rays; they are about 9 in number.

The distance of the ventral from the snout is equal to twice the length of the upper jaw; middle ventral ray is the longest, it being half as long as the postorbital part of the head.

The length of the pectoral equals three times that of the snout.

Radial formula: D. 80+; A. 70+; C. 9; P. 18; V. 3.

A single mutilated specimen, measuring 112 millimeters in its imperfect condition, was taken by the *Blake* from station CCCXXXVII, in 38° 20′ .08″ N. lat., 73° 23′ 20″ W. long., at a depth of 740 fathoms. The *Albatross* also obtained examples from station 2116, in 35° 45′ 23″ N. lat., 74° 31′ 25″ W. long., at a depth of 888 fathoms; from station 2205, in 39° 35′ N. lat., 71° 18′ 45″ W. long., at a depth of 1,073 fathoms; from station 2083, in 40° 26′ 40″ N. lat., 67° 05′ 15″ W. long., at a depth of 959 fathoms; from station 2115, in 35° 49′ 30″ N. lat., 74°

34′ 45″ W. long., at a depth of 843 fathoms; from station 2552, in 39° 47′ 07″ N. Lat., 70° 35″ W. long., at a depth of 721 fathoms; from station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. long., at a depth of 1,081 fathoms; from station 2074, in 41° 43′ N. lat., 65° 21′ 50″ W. long., at a depth of 1,309 fathoms; Cat. No. 35517, U. S. N. M., from station 2209, in 39° 34′ 45″ N. lat., 71° 30′ 30″ W. long., at a depth of 1,080 fathoms; Cat. No. 33522, U. S. N. M., from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. long., at a depth of 1022 fathoms; Cat. Nos. 33366 and 33481, U. S. N. M., from station 2077, in 41° 09′ 40″ N. lat., 66° 02′ 20″ W. long., at a depth of 1,255 fathoms; Cat. No. 35559, U. S. N. M., from station 2210, in 39° 37′ 45″ N. lat., 71° 18′ 45″ W. long., at a depth of 991 fathoms; Cat. No. 35519, U. S. N. M., from station 2206, in 39° 35′ N. lat., 71° 24′ 30″ W. long., at a depth of 1,043 fathoms; Cat. No. 35554, U. S. N. M., from station 2216, in 39° 47′ N. lat., 70° 30′ 30″ W. long., at a depth of 963 fathoms; Cat. No. 33380, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. long., at a depth of 858 fathoms; and Cat. No. 35,455, U. S. N. M., from station 2191, in 39° 45′ 30″ N. lat., 70° 17′ W. long., at a depth of 961 fathoms.

LYCODOPSIS, Collett.

Lycodopsis, COLLETT, Proc. Zoöl. Soc. London, 1879, 381 (type, *Lycodes pacificus*, Collett).
Leurynnis, LOCKINGTON, Proc. U. S. Nat. Mus., 1879, 326.

Zoarceoids with body elongate, eel-shaped, covered with small, smooth, imbedded scales. Head large; snout broad and long; interorbital space very narrow; mouth large, horizontal; teeth conical, those of the upper jaw in a single row, those of the lower in a band in front, the inner series enlarged, larger than the upper teeth; no teeth on vomer or palatines. Ventral fins very small; vertical fins continuous, without spines. (*Collett.*)

This genus is represented by one or two species from moderately deep water off the coast of California, Oregon, and Washington.

GYMNELIS, Reinhardt.

Gymnelis, REINHARDT, Dansk. Vidensk. Selsk. Afhandl., VII, 131, 1838 (type, *Ophidium viride*, Fabricius).—GÜNTHER, Challenger Report, XXII, 1887, 81.

Body elongate, naked. Vertical fins without spines; ventral fins none. Small, conical teeth on the jaws, vomer, and palatines. Gill-openings very narrow. No air bladder; pyloric cæca none; no anal papilla. Size small. Arctic seas.

GYMNELIS VIRIDIS, (FABRICIUS), REINHARDT.

Ophidium viride, FABRICIUS, Fauna Grönlandica, 141.
Gymnelis viridis, REINHARDT, K. Dansk. Vidensk. Selsk. Afhandl., VII, 1838, 131.—GAIMARD, Voy. Scand. Poiss., pl. XV.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 323; Challenger Report, XXII, 1887, 82.—COLLETT, Norsk. Nordh. Exped. Fisk., 123, pl. IV, fig. 32.—KRÖYER, Nat. Hist. Tidsskr., 1862, I, 258.—LÜTKEN, Kara-Havets, Fisk. in Dijmphna-Togtet, 125.
Gymnelis pictus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 324.

Height of body one-half the length of the head, which is contained about 6½ times in the total length; snout subconical, longer than the eye; jaws equal; mouth oblique; maxillary reaching beyond eye; teeth rather small, conical, in a single series on each side, forming a patch anteriorly; distance from snout to vent 2½ times length of head.

Pectoral rounded, inserted low, its length less than half that of the head. Dorsal commencing over posterior third of pectorals.

Radial formula: D. 100; A. 80.

Color, brownish, usually with dark transverse markings, but sometimes unspotted.

This species has been found in abundance in the Arctic seas, from Alaska to Nova Scotia.

MELANOSTIGMA, Günther.

Melanostigma, GÜNTHER, Proc. Zool. Soc. London, 1881, 20; Challenger Report, XXII, 1877, 82.

This genus agrees with *Gymnelis* and *Maynea* in the absence of ventral fins, and technically may be distinguished from both by the much more elongate teeth, which in the jaws, as well as on the vomer and palatines, stand in a single series. However, there are other striking differences, which will be mentioned in the subsequent description.

MELANOSTIGMA GELATINOSUM, GÜNTHER. (Figure 284.)

Melanostigma gelatinosum, GÜNTHER, Proc. Zool. Soc. London, 1881, 21, pl. II, fig. A; Challenger Report, XXII, 1887, 82.—GOODE and BEAN, Bull. Mus. Comp. Zool., 1883, 209.—JORDAN, Cat. Fish. N. Amer., 1885, 125.

Body is enveloped in a loose, delicate skin, as in *Liparis*. Head large, deep, compressed, with obtuse snout. Eye large, two-sevenths of the length of the head and longer than the snout. Cleft of the mouth rather oblique, but the lower jaw does not project beyond the upper. Lips not fleshy. Inside of the mouth, gill-openings, and vent black. The gill-opening is reduced to a very narrow foramen above the base of the pectoral fin. The origin of the dorsal fin and the root of the pectoral are enveloped in the loose skin of the body. The dorsal fin seems to commence above the middle of the pectoral, is low at first, but becomes considerably higher posteriorly. Pectorals very narrow, consisting of a few rays only. Upper parts tinged with a purplish gray; sides marbled with the same color, which toward the end of the tail becomes more intense, almost black.

Total length of the specimen 5½ inches; distance of the snout from the gill-opening seven-eighths inch, from the vent 1⅞ inches.

The type specimen was obtained on January 16, 1880, by Dr. Coppinger, of H. M. S. *Alert*, at Tilly bay, in the Straits of Magellan, in 24 fathoms.

The *Blake* secured an individual from station CCCXXXIV, in 38° 20′ 30″ N. lat., 73° 26′ 40″ W. lon., at a depth of 395 fathoms; and the *Albatross* obtained specimens from station 2003, in 37° 16′ 30″ N. lat., 74° 20′ 36″ W. lon., at a depth of 641 fathoms; from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., at a depth of 571 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; Cat. No. 32667, U. S. N. M., from station 2003, in 37° 16′ 30″ N. lat., 74° 20′ 36″ W. lon., at a depth of 641 fathoms; Cat. No. 35611, U. S. N. M., from station 2201, in 39° 30′ 45″ N. lat., 71° 35′ 15″ W. lon., at a depth of 538 fathoms. The *Fish Hawk* took additional specimens from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; Cat. No. 28762, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; Cat. No. 28901, U. S. N. M., from station 995, in 39° 40′ 30″ N. lat., 71° 31′ W. lon., at a depth of 358 fathoms; Cat. No. 28813, U. S. N. M., from station 947, in 39° 53′ 30″ N. lat., 71° 13′ 30″ W. lon., at a depth of 319 fathoms; Cat. No. 28853, U. S. N. M., from station 952, in 39° 55′ N. lat., 70° 28′ W. lon., at a depth of 396 fathoms.

Family BROTULIDÆ.

Brotulinæ, SWAINSON, Nat. Hist. Fish, 1839, II, 188, 301.
Brotuloidei, BLEEKER, Tentamen, 859, XXIV.
Brotulidæ, ADAMS, Man. Nat. Hist., 1854, 104.
Brotulina, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 371.

Ophidioidea, with body naked or covered with small scales. Dorsal and anal fins confluent with caudal. Ventrals jugular, reduced to one or two rays. Gill-openings wide, the gill-membranes free. Vent in anterior half of body. Barbel present or absent. Lateral line interrupted, or partially or completely obsolete.

ARTIFICIAL KEY TO THE GENERA OF BROTULIDÆ.

(Not strictly according to affinities, and for purposes of identification only.)

Barbels present on snout and lower jaw.
  I. Ventrals a pair of bifid filaments .... [BROTULA]
  II. Ventrals a pair of simple filaments .... [NEMATOBROTULA]
Barbels replaced by cilia or tubercles.
  I. Eye absent or rudimentary. Cave dwellers.
    A. No teeth on palatines; villiform teeth in jaws .... [LUCIFUGA]
    B. Strong teeth on palatines, and on mandibular edge .... [STYGICOLA]
No barbels, cilia, or tubercles.
  I. Caudal differentiated, with distinct stem.
    A. Ventral filaments single. A flat opercular spine.
      1. Head scaly .... [DINEMATICHTHYS]
      2. Head naked .... [BROSMOPHYCIS]

II. Caudal not fully differentiated, and often confluent.
A. Ventrals inserted on isthmus, not far from humeral symphysis ....Bythitinæ
1. Pectorals simple. Eyes present.
a. Lateral line present posteriorly, but broken in middle.
i. Palatines dentigerous. Ventrals a pair of filaments, each of two closely united rays. Bythites
ii. Palatines toothless. Ventrals a pair of simple rays ....Grammonus
b. Lateral line obsolete posteriorly.
i. Ventrals a pair of simple rays.
* Lateral line distinct on front of body.
† Palatines with teeth. Preoperculum unarmed.
A. Head scaly (except snout). Lateral line indistinct.
1. Operculum with a single spine. Vent median ....Catætyx
B. Head naked. Lateral line on trunk only.
1. Operculum without a spine. Vent postmedian ....Saccogaster
2. Operculum with two spines. Vent premedian ....Diplacanthopoma
†† Palatines with teeth. Preoperculum strongly armed.
A. Head partially naked. Lateral line obsolete posteriorly.
1. Operculum with one spine, preoperculum with 3–4.......Dicromita
** Lateral line obsolescent, almost or quite invisible.
† A feeble spine on the operculum.
A. Head smooth. Eyes small ....Bassozetus
B. Head crested. Eyes large ....Glyptophidium
†† Acute spines on head-bones and opercles.
A. A long, tapering tail. No pyloric cæca ....Dermatorus
ii. Ventrals a pair of bifid rays.
* Caudal rays exserted, but confluent with those of anal and caudal.
† Head scaly.
A. Preoperculum with small spines at its angle.
1. Operculum with one spine ....Neobythites
B. Preoperculum unarmed.
1. Two spines on operculum. Ventrals close together. Benthocometes
2. One strong spine on operculum. Ventrals far apart .....Bassogigas
C. Preoperculum with crenulated limb.
1. Ventrals feeble, close together..............................Alcockia
†† Head naked.
A. Lateral line not distinguishable.
1. Several strong spines on head .. ..Celema
B. Lateral line represented by a few large scales near shoulders.
1. Head smooth. Tail very attenuate ....Mœbia
** Caudal not confluent with vertical fins, but without distinct peduncle.
† Teeth on jaws, vomer and palatines in villiform bands.
A. Preoperculum unarmed. Head scaled.
1. A flat opercular spine.
a. Snout much produced and dilated. Lateral line very indistinct (or absent?)...............................Barathrodemus
2. Operculum with a bony ridge above, ending in a blunt point.
a. Snout not produced, broad, rounded, flattened at tip. Lateral line obsolete posteriorly ....Pycnocraspedum
3. Operculum a triangular flap, unarmed.
a. Lower pectoral rays prolonged, the lowest filamentous. Nematonus
c. Lateral line represented by three rows of pores, dorsal, lateral, and ventral.
i. Head spinigerous.
* Ventrals each of two distinct rays. Opercular spine moderate, straight. Porogadus
** Ventrals each of two united rays. Opercular spine strong, curved......Penopus
2. Pectorals simple. Eyes absent or rudimentary.
a. Body scaly. Eyes absent.
i. Ventrals bifid filaments. Teeth on jaws, vomer, and palatines .....Tauredophidium
3. Pectorals with lower rays differentiated.
a. Preoperculum armed with three spines, operculum with one. Lateral line obsolete posteriorly.
i. Ventrals simple, not close together ....Pteroidonus
ii. Ventrals bifid, approximate..Dicrolene

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Body is enveloped in a loose, delicate skin, as in *Liparis*. Head large, deep, compressed, with obtuse snout. Eye large, two-sevenths of the length of the head and longer than the snout. Cleft of the mouth rather oblique, but the lower jaw does not project beyond the upper. Lips not fleshy. Inside of the mouth, gill-openings, and vent black. The gill-opening is reduced to a very narrow foramen above the base of the pectoral fin. The origin of the dorsal fin and the root of the pectoral are enveloped in the loose skin of the body. The dorsal fin seems to commence above the middle of the pectoral, is low at first, but becomes considerably higher posteriorly. Pectorals very narrow, consisting of a few rays only. Upper parts tinged with a purplish gray; sides marbled with the same color, which toward the end of the tail becomes more intense, almost black.

Total length of the specimen 5½ inches; distance of the snout from the gill-opening seven-eighths inch, from the vent 1⅞ inches.

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Brotuloidei, BLEEKER, Tentamen, 859, XXIV.
Brotulidæ, ADAMS, Man. Nat. Hist., 1854, 104.
Brotulina, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 371.

Ophidioidea, with body naked or covered with small scales. Dorsal and anal fins confluent with caudal. Ventrals jugular, reduced to one or two rays. Gill-openings wide, the gill-membranes free. Vent in anterior half of body. Barbel present or absent. Lateral line interrupted, or partially or completely obsolete.

ARTIFICIAL KEY TO THE GENERA OF BROTULIDÆ.

(Not strictly according to affinities, and for purposes of identification only.)

Barbels present on snout and lower jaw.
  I. Ventrals a pair of bifid filaments .... [BROTULA]
  II. Ventrals a pair of simple filaments .... [NEMATOBROTULA]
Barbels replaced by cilia or tubercles.
  I. Eye absent or rudimentary. Cave dwellers.
    A. No teeth on palatines; villiform teeth in jaws .... [LUCIFUGA]
    B. Strong teeth on palatines, and on mandibular edge .... [STYGICOLA]
No barbels, cilia, or tubercles.
  I. Caudal differentiated, with distinct stem.
    A. Ventral filaments single. A flat opercular spine.
      1. Head scaly .... [DINEMATICHTHYS]
      2. Head naked .... [BROSMOPHYCIS]

II. **Caudal not fully differentiated, and often confluent.**
A. **Ventrals inserted on isthmus, not far from humeral symphysis** .... BYTHITINÆ
1. **Pectorals simple.** Eyes present.
a. Lateral line present posteriorly, but broken in middle.
i. Palatines dentigerous. Ventrals a pair of filaments, each of two closely united rays.
ii. Palatines toothless. Ventrals a pair of simple rays .... BYTHITES
b. Lateral line obsolete posteriorly .... GRAMMONUS
i. Ventrals a pair of simple rays.
* Lateral line distinct on front of body.
† Palatines with teeth. Preoperculum unarmed.
A. Head scaly (except snout). Lateral line indistinct.
1. Operculum with a single spine. Vent median .... CATÆTYX
B. Head naked. Lateral line on trunk only.
1. Operculum without a spine. Vent postmedian .... SACCOGASTER
2. Operculum with two spines. Vent premedian .... DIPLACANTHOPOMA
†† Palatines with teeth. Preoperculum strongly armed.
A. Head partially naked. Lateral line obsolete posteriorly.
1. Operculum with one spine, preoperculum with 3-4 .... DICROMITA
** Lateral line obsolescent, almost or quite invisible.
† A feeble spine on the operculum.
A. Head smooth. Eyes small .... BASSOZETUS
B. Head crested. Eyes large .... GLYPTOPHIDIUM
†† Acute spines on head-bones and opercles.
A. A long, tapering tail. No pyloric cæca .... DERMATORUS
ii. **Ventrals a pair of bifid rays.**
* **Caudal rays exserted, but confluent with those of anal and caudal.**
† **Head scaly.**
A. **Preoperculum with small spines at its angle.**
1. **Operculum with one spine** .... NEOBYTHITES
B. **Preoperculum unarmed.**
1. **Two spines on operculum. Ventrals close together.** BENTHOCOMETES
2. **One strong spine on operculum. Ventrals far apart** ..... BASSOGIGAS
C. **Preoperculum with crenulated limb.**
1. **Ventrals feeble, close together** .... ALCOCKIA
†† **Head naked.**
A. Lateral line not distinguishable.
1. Several strong spines on head .... CELEMA
B. Lateral line represented by a few large scales near shoulders.
1. Head smooth. Tail very attenuate .... MŒBIA
** Caudal not confluent with vertical fins, but without distinct peduncle.
† Teeth on jaws, vomer and palatines in villiform bands.
A. Preoperculum unarmed. Head scaled.
1. A flat opercular spine.
a. Snout much produced and dilated. Lateral line very indistinct (or absent?) .... BARATHRODEMUS
2. Operculum with a bony ridge above, ending in a blunt point.
a. Snout not produced, broad, rounded, flattened at tip. Lateral line obsolete posteriorly .... PYCNOCRASPEDUM
3. Operculum a triangular flap, unarmed.
a. Lower pectoral rays prolonged, the lowest filamentous. NEMATONUS
c. Lateral line represented by three rows of pores, dorsal, lateral, and ventral.
i. Head spinigerous.
* Ventrals each of two distinct rays. Opercular spine moderate, straight. POROGADUS
** Ventrals each of two united rays. Opercular spine strong, curved...... PENOPUS
2. **Pectorals simple.** Eyes absent or rudimentary.
a. **Body scaly.** Eyes absent.
i. Ventrals bifid filaments. Teeth on jaws, vomer, and palatines ..... TAUREDOPHIDIUM
3. **Pectorals with lower rays differentiated.**
a. Preoperculum armed with three spines, operculum with one. Lateral line obsolete posteriorly.
i. Ventrals simple, not close together .... PTEROIDONUS
ii. Ventrals bifid, approximate .... DICROLENE

b. Preoperculum unarmed. A single spine on operculum. Lateral line absent(?)
i. Ventrals each a pair of filaments, closely united throughout, approximate..MIXONUS
B. Ventrals inserted on humeral symphysis.
1. Lateral line continuous, indistinct.
a. Ventrals a pair of simple filaments.
i. Pseudobranchiæ present..SIREMBO
ii. Pseudobranchiæ absent..MONOMITOPUS
2. Lateral line obsolete (in almost every case).
a. Ventrals bifid filaments.
i. Teeth in villiform bands on jaws, vomer, and palatines. Head strongly armed.
*Eyes minute. Snout armed..ACANTHONUS
b. Ventrals simple filaments.
i. Eye rudimentary or absent.
* Body with small, deciduous scales. No lateral line.
† Eye not visible externally. Villiform bands of teeth on jaws, vomer, and palatines..TYPHLONUS
** Body naked. Notochord persistent.
† Eye visible through skin. A few fang-like teeth on vomer and mandible..BARATHRONUS
†† Eye not visible. No teeth on maxillary or palatines. Rudimentary teeth on vomer. Small teeth on mandible..APHYONUS
C. Ventrals inserted under hyoid region.
1. Ventrals long bifid filaments.
a. Weak teeth, in jaws only..RHODICHTHYS
D. Ventrals absent. (Uncertain as to family and subfamily.)
1. Eyes rudimentary.
a. Head and body scaleless.
i. Mouth vertical, vomer and palatines toothless..ALEXETERION
2. Eyes developed.
a. Head uncrested, scaleless. No lateral line.
i. Villiform teeth in jaws, vomer, and palatines.
* Fin rays very delicate. B. 8.
† Gill-rakers almost rudimentary..HEPHTHOCARA
b. Head crested, scaly.
i. Lateral line of large, specialized scales..LAMPROGRAMMUS

Genus BYTHITES, Reinhardt.

Bythites, REINHARDT, Dansk. Vidensk. Selsk. Afhandl., VII, 1838, 178.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 375.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 253.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 795.

Brotulids having the body elongate, covered with minute scales, and with lateral line interrupted over the vent. Head thick, naked, with cirri; mouth large and jaws equal. A small spine at the angle of the operculum. Teeth in bands on jaws, vomer, and palatines. Eye moderate. Vertical fins confluent; ventral fins, a pair of bifid filaments, each composed of two rays closely united nearly to the tip. Branchiostegals 8; gill membranes closely united, free from the isthmus. Air bladder large. Two pyloric cæca. No barbel. A thick, conical anal papilla (in the male).

BYTHITES FUSCUS, REINHARDT.

Bythites fuscus, REINHARDT, Dansk. Vidensk. Selsk. Afhandl., VII, 1838, 179, pls. VII–VIII.—GÜNTHER, *op. cit.*, 375.

A *Bythites*, having a body somewhat compressed, lipariform, its height about 4½ times in its length. Head thick and large, its length more than one-fourth that of body, with obtuse snout, naked, with minute cirri. Mandible, long, curved; it extends far behind vertical from posterior margin of orbit. Eye small. Scales moderate, on body. Lateral line complete, but interrupted over vent, the two parts slightly overlapping the same vertical. Vertical fins confluent, enveloped in thick skin. Pectorals broad, lanceolate, with broad base. Ventrals filiform, reaching behind origin of pectoral, as long as pectoral and two-thirds as long as head. A conspicuous anal papilla in the male.

The only known specimen, now in the museum at Copenhagen, was obtained in Greenland half a century ago.

GRAMMONUS, Gill.

Oligopus, Sacépèdes.—Risso, Ichth. Nice, 1810, 142.
Pteridium, Günther Cat. Fish. Brit. Mus., IV, 1862, 376 (not Scopoli[1]); Challenger Report, XXII, 105.—Canestrini, Pesci d'Italia, 191.—Moreau, Hist. Nat. Poiss., France, VII, 228 (family *Pterididæ*.)
Grammonus, Gill, MS.

Head and body compressed, covered with small scales, only the upper part of the head and the snout being naked. The body is moderately elongate, the tail but little attenuated. Snout obtuse, not swollen, with the jaws even in front, and with the mouth obliquely ascending. Bones of the head firm, the muciferous canals narrow. Eye small. Operculum with a short spine behind; preoperculum with two short projections near the angle. Barbels none. Bands of villiform teeth in the jaws and an open V-shaped band on the vomer; some slightly enlarged teeth along the inner series of the mandible and on the vomer; palatine teeth none. Vertical fins confluent; ventrals close together, reduced to a pair of fine simple filaments, and inserted somewhat behind the isthmus, below the middle of the operculum. Lateral line interrupted. Gills 4; pseudobranchiæ none. Branchiostegals 8. Pyloric appendages 2. (*Günther.*)

GRAMMONUS ATER, (Risso), Goode and Bean.

Oligopus ater, Risso, Ichth. Nice, 1810, 142, pl. XI, fig. 41.
Oligopus niger, Risso, Hist. Nat. Europe Méridionale, 1826, III, 338.
Gadopsis ater, De Filippi, Siebold and Kölliker, Zeitsch. Wiss. Zoöl., 1855, 170.
Pteridium atrum, De Filippi and Verany, Mem. Accad. Sci., Turin (2), XVIII. Sopra Alcuni Pesci (separate from last), 11, fig. 6.—Günther, *loc. cit.*—Canestrini, *loc. cit.*—Moreau, *loc. cit.*, fig. 173.

Body elongate, somewhat compressed, its height 5 to 6 times in total length. Head large and long, its length 4 times in that of body. Mouth large, oblique, the maxillary extending beyond vertical from posterior margin of orbit. Jaws nearly equal. A row of sharp teeth, far apart and few in number, in the midst of others which are closely set and very small. Vomer with 2–4 large, recurved teeth, in addition to several small ones. Tongue smooth. Eye round, small, its diameter scarcely one-eighth the length of the head. Lateral line interrupted, sometimes for a certain distance double.

Dorsal origin in vertical from middle of pectoral, ventrals filiform, closely approximated, each composed of two short rays.

Radial formula: D. 64; A. 44; P. 20; V. 2.

Color, blackish, sometimes with a reddish tint.

This form is very rare, having been recorded only from the Mediterranean off Nice, where it lives at considerable depths, approaching the shores in August to deposit its eggs in the crevices of rocky ledges. It is not positively known to inhabit the region beyond the hundred-fathom line.

Günther has studied the lateral line in a single specimen, lately acquired by the British Museum, and reports that it is rather indistinct and interrupted, and that, in his judgment, the fact that the ends of the two portions overlap each other has given rise to the statement that the lateral line is double along a portion of the tail.

CATÆTYX, Günther.

Catætyx, Günther, Challenger Report, XXII, 104.

Body compressed, elongate, covered with very small and thin scales; lateral line indistinct, interrupted. Head oblong, with somewhat pointed snout, covered with very small scales, only the anterior part of the snout naked; bones of the head rather firm, but with the muciferous system well developed, the canals having wide openings along the infraorbital, and on the lower limb of the preoperculum. Eye rather small. Nostrils far apart, the posterior in front of the eye and the anterior at the extremity of the snout. Operculum with a spine behind; no other armature on the head. Snout not swollen, but the upper jaw slightly overlapping the lower; barbels none. Mouth wide. Bands of villiform teeth in the jaws, on the vomer and the palatines bones; a series of larger teeth along the sides of the lower jaw. The tail is not much attenuated. Vertical fins confluent; ventrals close together, reduced to a pair of fine, simple filaments, and inserted somewhat behind the isthmus, below the middle of the operculum.

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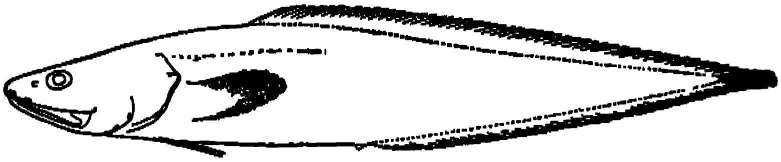
[1] *Pteridium* of Scopoli (1777, page 454) is according to Gill, the equivalent of *Pteraclis* of Gronovius.

Gills 4, with short, broad gill-rakers and well developed laminæ. Pseudobranchiæ none. Branchiostegals 8. Pyloric appendages. (*Günther.*)



CATÆTYX MESSIERI.

This genus is represented by two species, *Catætyx Messieri, loc. cit.*, pl. XXIII, Fig. B, obtained by the *Challenger* in Messier Straits (Station 306 A), at a depth of 345 fathoms.

The *Albatross* took four specimens of another form, *Catætyx rubrirostris*, in 205–359. fathoms off the coast of California.

SACCOGASTER, Alcock.

Saccogaster, ALCOCK, Ann. and Mag. Nat. Hist., 1889, (Nov.), 389; Bathybial Fishes of the Bay of Bengal, 1889, 15; Ann. and Mag. Nat. Hist. (6) VIII, July, 1891, 30, pl. VII, Fig. 3; Proc. Z. S., London, 1891, 226.

Body compressed, little elongate, partly invested by minute, membranous, non-imbricated scales. Abdomen large. Head with loose, scaleless skin. Snout a little inflated, not projecting beyond the equal jaws. Bones of the head firm, without spines, the mucous channels well developed, but without conspicuous external openings. Opercles unarmed. No barbels. Eyes small. Mouth wide. Bands of villiform teeth in jaws, palatines, and vomer, and an inner row of enlarged teeth in the mandible. Vertical fins confluent with the caudal. Ventrals simple filaments. Four gills; 8 branchiostegals; no pseudobranchiæ. No pyloric cæca.

Represented by *Saccogaster maculatus*, Alcock (*loc. cit.*), from 103 fathoms, Bay of Bengal, lat. 20° 17′ 30″ N., lon. 88° 50′ E., and from stations 120 of the *Investigator*, in 240–276 fathoms.

The name *Saccogaster*, which alludes to the distended abdomen, was based upon the appearance of the type described in 1889, which Alcock has since found to contain distended ovaries, full of developing embryos. *Saccogaster* is viviparous, and the males have been found to have a postanal papilla which serves as an intromittent organ.

DIPLACANTHOPOMA, Günther.

Diplacanthopoma, GÜNTHER, Challenger Report, XXII, 1887, 15.

Body compressed, elongate, covered with small and thin scales; lateral line very indistinct; head rather depressed, naked, with thin bones and wide muciferous channels. Eyes of moderate size. Nostrils far apart. The posterior widely open, in the front of the eye, and the anterior at the extremity of the snout. Operculum with two spines, one pointing backwards, the other situated behind the angle of the preoperculum and pointing downwards; preoperculum unarmed. Snout not swollen, broad, depressed, the upper jaw slightly overlapping the lower; barbels, none. Mouth of moderate width; bands of villiform teeth in the jaws, on the vomer and the palatine bones. Tail attenuated; vertical fins confluent; ventrals close together, reduced to a pair of simple filaments and inserted somewhat behind the isthmus below the middle of the operculum. Gills, 4, with lanceolate widely-set gill-rakers, and well-developed laminæ. Pseudobranchiæ, none. (*Günther.*)

DIPLACANTHOPOMA BRACHYSOMA, GÜNTHER.

Diplacanthopoma brachysoma, GÜNTHER, Challenger Report, XXII, 115, Pl. XXIII, fig. C; ALCOCK, Ann. and Mag. Nat. Hist., 1889, 385.

Sirembo muraenolepis, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 1888, p. 273, pl. XXIII, fig. 4, 4a. (Off Soudan).

The greatest depth of the body is below the origin of the dorsal fin, and contained twice and one-third in the distance of the extremity of the snout from the vent. The head is about as deep as broad, its length being equal to the distance of the vent from the root of the ventral fins, and more than one-half of the length of the body exclusive of the tail. The vent is nearer to the snout than to the root of the caudal. Eye of moderate size, without orbital fold, as long as the snout, one-fifth of the length of the head and equal to the width of the flat interorbital space. Mouth of moderate width, the maxillary extending somewhat behind the eye and being slightly dilated behind. All the teeth are in narrow villiform bands, that of the vomer being open and Λ-shaped. The superficial bones of the head are thin, and those of the infraorbital ring and of the mandible dilated for the reception of the wide mucous canals. Of the opercular spines the horizontal is remarkably long, much longer than the lower vertical one.

The vertical fins are completely united, and, owing to the great attenuation of the tail, no caudal portion can be distinguished. The rays are very thin, closely set, and of moderate length. Origin of the dorsal fin immediately behind the root of the pectoral, and that of the anal immediately behind the vent. Pectoral fins rather narrow, inserted on a short, broad, and partly free pedicle; they are longer than the postorbital portion of the head; ventrals half as long as the distance of their root from the vent.

The scales are rather small, thin, cycloid, and rather deciduous; if a lateral line is present, it is confined to the trunk.

Upper parts of a uniform light brownish color; the lower parts and the fins colorless.

The type, 4½ inches long, was taken by the *Challenger* off Pernambuco, Brazil (station 122), in 350 fathoms. Dr. Alcock has identified with the same species a female 4½ inches long with gravid ovaries, taken by the *Investigator* in the Andaman sea, 7½ miles east of North Cinque Island in 490 fathoms (=D. Alcockii, G. & B. See p. 523, below).

DICROMITA, GOODE and BEAN, n. g.

Brotulids resembling in form and general appearance *Catætyx* and *Diaplacanthopoma*, having the lateral line obsolete, or interrupted posteriorly; ventrals a pair of simple, fine filaments; and teeth upon the palatines. It has, however, three or four small spines upon the preoperculum, as well as a sharp spine upon the upper angle of the operculum; and the lateral line, though indistinct, is traceable for half or three-fourths the length of the body, which, like the upper part of the head, is covered with small, deciduous scales, the opercular region being apparently scaleless, and the bones of the suborbital region almost uncovered, with conspicuous sinuses, which show through the transparent texture of the surface. The head is oblong, the snout being somewhat produced, depressed and turgid, resembling, though in a less degree, that of *Barathrodemus*. Eye moderate, conspicuous. Mouth wide; teeth villiform, in bands on the jaws and palatines, and very minute upon the vomer, which has a roughened, knob-like enlargement at its angle. Vent premedian. Vertical fins confluent; ventrals rooted very close together, each reduced to a fine, flexible, simple filament, planted somewhat behind the isthmus and below the middle of the operculum. Gills 4, with well-developed laminæ and rather long, slender gill-rakers. Branchiostegals 8. Pseudobranchiæ apparently absent.

DICROMITA AGASSIZII, GOODE and BEAN, n. s. (Figure 285).

Body elongate, much compressed, its height about one-fifth of its total length; its width about half its greatest height. The length of the head is slightly greater than the height of the body, and equal to twice its own width. Mouth very large, the maxillary, which is curved and much dilated at its extremity, reaching far behind the vertical from the posterior margin of orbit. Jaws nearly equal, the snout being considerably produced and dilated, its length equal to the diameter of the eye and one-fourth the length of the head. Teeth very fine, villiform, in bands on jaws and palatines, and also present on vomer, though very small, especially upon the rounded, globular process at the angle. Lateral line very indistinct, interrupted, but extending behind the vent at least one-third of the way to the tip of the tail. Dorsal origin nearly in vertical from the axil of the pectoral; ventrals very slender, villiform, closely approximate at their roots, and less than half as long as the head.

Color, brownish.

A specimen was obtained by the *Blake*, off Granada, station XCIII, at a depth of 291 fathoms. This specimen, from which the shaded figure was made, has evidently had its tail broken off and the damage repaired. The collateral type was obtained by the *Albatross* at station 2374, in 29° 11′ 30′ N. lat., 85° 29′ W. lon., at a depth of 26 fathoms.

DICROMITA METRIOSTOMA, (VAILLANT), GOODE and BEAN.

Sirembo metriostoma, VAILLANT, Exp. Sci. Travailleur et Talisman, 270, pl. XXIII, figs 3, 3*a*, 3*b*.

Body elongated, compressed, elevated anteriorly, its height equal to one-seventh of its length. Head length about one-fifth that of body. Snout oblong, rounded, its length one-fifth of head. The upper jaw is slightly the longer, and extends back to the vertical from the posterior margin of orbit. Teeth in villiform bands on the jaws, vomer, and palatines.

Nostrils small, circular, in same horizontal line. Eye circular, its diameter slightly greater than the length of the snout, 4½ times in length of head and equal to width of interorbital space. A strong horizontal spine on the operculum, and two or three at the angle of the preoperculum, hidden under the skin.

Vent premedian, separated from the origin of the ventrals by a distance slightly greater than the length of the head. Origin of dorsal slightly behind vertical from base of pectoral. Anal origin near vent. Pectorals half as long as head, simple. Ventrals reduced to a pair of simple filaments which surpass the pectorals.

Scales small, distinct, not so deciduous as in many similar forms, about 151 in longitudinal and 33 in vertical series. Lateral line obsolete in its posterior half.

Color, grayish, with blackish belly and darker edges to the vertical fins.

The French explorers obtained one specimen from the Banc d'Arguin (station XCV), 1,230 fathoms, two from off the Azores and from station CXXI, in 1,442 fathoms, and one from station CXXVII, in 1,257 fathoms.

DICROMITA MICROPHTHALMA, (VAILLANT), GOODE and BEAN.

Sirembo microphthalma, VAILLANT, Exp. Sci. Travailleur et Talisman. 275, pl. XXIV, fig. 4.

Body moderately compressed, anguilliform, its height one-thirteenth of its total length. Head elongate, its length one-fifth that of the body. The snout is four-elevenths of the head, and somewhat spatulate. The upper jaw extends somewhat beyond the lower one. Mouth inferior, half as long as the head; the maxillary passes the vertical from the posterior margin of the orbit. Teeth small, in villiform bands upon the jaws, vomer, and palatines. Eye very small, nearly hidden in the skin, but distinct; its diameter about one-twentieth that of the head, while the interorbital space is one-fourth. Branchial opening very wide. Opercular bone indistinct. The preoperculum has four strong spines at its angle; the operculum has 1 spine, strong, somewhat curved upward, prominently projecting. Head naked, except upon the cheek and the opercular flap.

Vent at a distance from the base of the ventrals greater than the length of the head. Scales exceedingly small, scarcely visible to the naked eye, imbedded in the skin, more distinct in the ventral region than on the rest of the body; lateral line represented by a series of inconspicuous elevations, which are not noticeable in the latter half of its length; it is near the dorsal outline.

Origin of dorsal over the middle of pectoral; that of the anal immediately behind the vent. The anal fins are low. The pectoral is composed of 13 rays, half as long as the head, lanceolate, the two lower rays detached without being more developed than the others. Ventrals still smaller (perhaps mutilated in the specimen figured by Vaillant).

Color white, except bluish-black upon the head and abdomen, and the pectorals a deep brown.

Three specimens were obtained by the French Expedition at station CI, off the Cape Verde Islands, at a depth of 3,200 meters. The fish is very remarkable by reason of the smallness of its eyes and the peculiar character of the scales.

DICROMITA ONCEROCEPHALA, (VAILLANT), GOODE and BEAN.

Sirembo oncerocephalus, VAILLANT, Exp. Sci. Travailleur et Talisman, 277, Pl. XXIV, Fig. 6.

Body elongate, compressed, its height one-ninth and its thickness one-third of its length. Length of the head two-elevenths of the length of the body; it is rounded. Snout hemispherical, occupying three-elevenths of the length of the head and projecting beyond the mouth. Mouth moderate, although the maxillary extends behind the eye; the mouth does not extend to the middle of the length of the head. The two jaws, the vomer, and the palatines are armed with fine teeth in villiform bands. Eye small, inconspicuous, hidden in the integuments, its diameter one-fifteenth of the length of the head; interorbital space five times as wide as the diameter of the orbit. Branchial opening wide. The bones composing the opercular flap are hidden in the mucous integument which covers the head, and indistinct; only one flexible spine can be seen on the operculum. A few scales upon the vertex, and more upon the jaws and opercular flap. Vent at a third of the distance from the snout to the tail, and separated from the origin of the ventrals by a distance a little greater than the length of the head. Scales very minute, imbricated; no lateral line is perceptible.

The origin of the dorsal is a little in advance of the branchial opening; the anal immediately behind the vent, both quite high posteriorly, their height nearly half that of the body. Caudal rays prominent (Vaillant says "*assez distincte*," but the figure shows the vertical fins to be confluent). Pectorals short, a little more than half as long as the head, composed of 21 rays. Ventrals as long as the pectoral.

Color, pure white; head entirely bluish-black, as is also the abdomen, though not so dark..

A single specimen was obtained by the French explorers from station CI, off the Cape Verde Islands, in 3,200 meters.

Bathyonus glutinosus, Alcock, Ann. and Mag. Nat. Hist., Sept., 1890, 210, from off the Madras coast, 98-102 fathoms, is possibly of this genus.

BASSOZETUS, Gill.

Bathynectes, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 20; Challenger Report, XXII, 1887, 109 (name preoccupied in carcinology).

Bassozetus, GILL, Proc. U. S. Nat. Mus., VI, 1883, 259.

Bathyonus, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1886, 603.

Brotulids with body compressed and long tapering tail, covered with deciduous, thin scales of moderate size. Bones of head very soft and cavernous; a feeble spine at upper angle of operculum, which is expanded backwards, a thin membranous plate, nearly as long as high and not at all excavated. Preorbital membranous, not excavated, and expanded on the closed supramaxillaries. Operculum spineless. Shoulders unarmed. Snout obtuse, scaleless; the jaws nearly equal in front. Mouth wide; teeth in villiform bands on the jaws, vomer, and palatines. Barbel none. Eyes small. Pectoral fins simple; caudal rays confluent with those of dorsal and anal, but somewhat exserted. Ventrals close together at base, each a single simple filament, and inserted below the rounded angle of the preoperculum.

Branchiostegals, 8. Gills, 4; gill-laminæ short; gill-rakers long and stiff on the first branchial arch. Pseudobranchiæ, none. Pyloric appendages, none.

Bassozetus glutinosus (Alcock), Ann. and Mag. Nat. Hist., 1889, II, 211, was taken by the *Investigator* at station 93, in the Bay of Bengal, at a depth of 1,310 fathoms.

BASSOZETUS NORMALIS, GILL. (Figure 287.)

Bassozetus normalis, GILL, Proc. U. S. Nat. Mus., 1883, 259.

Body much compressed, its width in the region of the vent not more than one-third of its height, which at the same point is about one-ninth of the total length. The greatest height of the body, over the origin of the pectorals, is about two-thirds the distance from the base of the pectorals to the vent, the vent being about twice as distant from the base of the caudal rays as from the snout. Head moderately compressed, flat above; with snout obtuse, rounded, turgid; lower jaw considerably included. The length of the head contained nearly six times in the total length.

The bones of the head not completely ossified, very cavernous in the alcoholic specimen, the head showing many deep sinuosities and depressions. Eye very small, its diameter about one-fourth the length of the snout, and situated about midway between the tip of the snout and the vertical from the posterior end of maxillary. Teeth all small and short, densely set, forming narrow, villiform bands; vomerine band open V-shaped. The dorsal fin begins far in advance of the origin of the pectoral and above the upper angle of the gill-opening; the rays are longest in the region over the vent. The anal begins immediately behind the vent; its rays are not quite so long as those of the dorsal. Pectoral with broad base, short, not extending much more than half way to the vertical from the vent, its length considerably less than that of the postorbital portion of the head. Ventral rays very slender, villiform, reaching almost to the vent, far beyond the pectoral; their length almost equal to that of the head. Scales moderate, very deciduous, extending upon the cheeks and on the top of the head almost to the tip of the snout. No evidence of a lateral line.

Radial formula: D. 116; A. 96.

Color light, the head and abdomen blackish; the inside of the mouth purplish-brown.

The *Blake* secured specimens from station CCIV, in 24° 33′ N. lat., 84° 23′ W. lon., at a depth of 1,920 fathoms; and from station LXXXIV, off Dominica, in 1,131 fathoms. The *Albatross* also obtained examples, Cat. No. 49416, U. S. N. M., from station 2380, in 28° 02′ 30″ N. lat., 87° 43′ 45″ W. lon., at a depth of 1,430 fathoms; Cat. No. 33306, U. S. N. M., from station 2042, in 39° 33′ N. lat., 68° 26′ 45″ W. lon., at a depth of 1,555 fathoms.

BASSOZETUS COMPRESSUS, (GÜNTHER), GOODE and BEAN.

Bathynectes compressus, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 20.
Bathyonus compressus, GÜNTHER, Challenger Report, XXII, 1887, XXII, Fig. A.

The greatest depth of the body is above the end of the gill-cover and about one-half of the length of the trunk, the vent being twice as distant from the extremity of the tail as from the snout; consequently, the tail is but moderately attenuated. Head compressed like the body, and about two-thirds of the length of the trunk; the superficial bones form large muciferous cavities, which, when full, must give to the head a much more evenly rounded appearance than in the preserved state, when the supporting bony ridges project more or less from under the skin. The snout is slightly swollen, but the jaws are nearly even in front, the wide mouth slightly ascending forwards. The maxillary has the form usual in these Gadoid fishes, is dilated behind, and extends far behind the eye.

The eye is very small, one half of the length of the snout, and about one-eleventh of that of the head; it is placed up on the side, and does not possess an orbital fold of the integument. The interorbital space rather convex, and equal in width to three diameters of the eye.

All the teeth are very small and short, densely set, and form villiform bands. The broadest is that of the maxillary bone, and it is quite uncovered on the sides, no labial folds being developed. The palatine band is broader than the mandibulary, and the vomerine band Λ-shaped, each arm being bent with the convexity inwards.

Gill-opening and cavity very wide and of an intense black. The gill-rakers are much longer than the laminæ, 15 in number on the anterior arch, besides some rudimentary ones above.

The dorsal fin commences above the upper end of the gill-opening, with short rays partly hidden in the skin; the rays become longer in the middle of the fin, but remain of moderate length, and the anal rays are still shorter. The pectoral has a rather narrow base, is quite free, and composed of feeble rays; its length is only half that of the head. Ventral rays very feeble, reaching somewhat beyond the root of the pectoral.

Only very few of the thin, cycloid, scales have been preserved; they are of moderate size, there being about sixteen in a transverse series running from the vent to the dorsal fin. The lateral line, if it was developed, can no longer be traced.

Radial formula: D. 166; A. 92; P. 23; V. 1. Color, blackish, with the fins, head, and abdomen black. (*Günther.*)

The species was obtained by the *Challenger* from the mid-Atlantic in 1,500 fathoms (station 107), and also from the Philippines (station 205), at a depth of 1,050 fathoms.

BASSOZETUS TÆNIA, (GÜNTHER), GOODE and BEAN.

Bathyonus tænia, GÜNTHER, Challenger Report, XXII, 1887, 110, Pl. XXIII, Fig. A.

The greatest depth of the body is below the origin of the dorsal fin and about one-third of the length of the trunk, the vent being not quite thrice as distant from the extremity of the tail as from the snout. Therefore the whole fish, and especially the tail, is much attenuated. Head not compressed, low and long, forming four-sevenths of the length of the trunk. Structure of the bones of the head as in *Bassozetus compressus.* Snout rather swollen and broad, the upper jaw but slightly overlapping the lower. Maxillary extending far behind the eye, which is very small, one-third the length of the snout, about one-fourteenth of that of the head, and one-fourth of the width of the interorbital space. All the teeth are very small and short, densely set, forming narrow villiform bands; vomerine band open, V-shaped. Gill-cavity deep black; gill-rakers long and slender, sixteen in number, with some rudimentary ones in front and behind.

The dorsal fin commences above the upper end of the gill-opening, with short rays partly hidden in the skin; the rays become longer on the anterior third of the tail, but remain of moderate length, and the anal rays are still shorter. The pectoral has a broad base, is quite free, and composed of rather feeble rays; its length is equal to that of the postorbital part of the head. Ventral rays very feeble, reaching nearly to the middle of the pectoral.

The scales must have been extremely thin, and rather small; there are probably about twenty in a transverse series running from the vent to the dorsal fin. The lateral line can not be made out.

Radial formula: D. 138; A. 115; P. 30.

Light-colored (possibly pink in life), with the head and abdomen black.

BASSOZETUS CATENA, GOODE and BEAN. (Figure 286.)

Bathyonus catena, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 603.—GÜNTHER, Challenger Report, XXII, 1887, 111.

Body very elongate, much compressed, and tapering into a slender, whip-like tail. Its height (19 millimeters) is contained 1½ times in length of head and 12½ times in that of the body.

Head without spines, very cavernous, not much compressed, higher than body, its length (27 millimeters) contained 8⅔ times in that of body. Interorbital area somewhat convex, its width (measured upon the bone) equal to the diameter of the eye and about equal to that of the snout, and contained 5 times in the length of head.

The muciferous channel upon the infraorbital ring shows in its course several wide subcircular sinuses, closely approximated; a similar row upon the posterior edge of the preoperculum and continued forward upon the under surface of the mandible; the vertex also has a semicircle of similar sinuses. To the chain-like appearance of these rows of ducts the specific name has reference. (The appearance of a spine over the eye, as shown in the drawing, is due simply to the shrinking of the porous adjacent regions.)

The maxilla extends beyond the vertical through the posterior margin of orbit, its length equal to that of postorbital part of head. Mandible two-thirds as long as head and equal in length to height of body. Jaws, vomer, and palate with bands of villiform teeth; the vomerine band V-shaped.

Nostrils in front of the middle of the eye, separated by a slight interspace, the anterior nearer to its mate than to the tip of the snout.

Branchiostegals 8. Pseudobranchiæ absent.

Gill-rakers long and numerous, the longest slightly exceeding in length the diameter of eye; 15 developed below the angle of the first arch, besides several rudiments.

The dorsal origin is slightly behind that of the pectoral, its distance from the tip of the snout (32 millimeters) about 7⅓ in total; rays well developed; in the anterior third of the fin, in a space equal to the length of the head, were counted 20 rays, the longest of which is two-fifths as long as the head.

The anal origin is under the twenty-first dorsal ray; its rays are shorter than those of the dorsal. The pectoral extends to the vertical from the eighteenth ray of the dorsal. It is four-fifths as long as the head.

The ventrals are composed each of a simple filament, the origin slightly in advance of the vertical through the pectoral origin, the length two thirds that of the head. They do not reach near to the vent, the distance of which from the origin of the ventrals (30 millimeters) is slightly greater than the length of the head.

Color, brownish yellow. Head and abdomen blackish.

The types (No. 37341) are from *Albatross* station 2379, N. lat. 28° 00′ 15″, W. lon. 87° 42′, 1,467 fathoms. The length of the longest is 237 millimeters, of the other 227 millimeters.

GLYPTOPHIDIUM, Alcock.

Glyptophidium, ALCOCK, Ann. and Mag. Nat Hist., 1889, 390; Bathybial Fishes of the Bay of Bengal, 17.

Head large, body compressed, with a long, tapering tail. Scales deciduous and very thin. Bones of head soft and cavernous, with prominent outstanding crests. Operculum small, with one feeble spine. Snout obtuse. Jaws equal in front. Mouth wide. Villiform teeth in narrow bands in the jaws, palatines, and vomer. No barbel. Eyes large. Caudal free. Ventrals simple filaments. Gills four, with short laminæ. Branchiostegals eight. Pseudobranchiæ. Pyloric appendages small.

The genus, which is separated from *Bassozetus* chiefly by the crests on the head ("in spirit, frill-like, membranous, longitudinal"), is known from a single specimen of the species *G. argenteum*, taken by the *Investigator* in the Andaman Sea, off Ross Island, in 271 fathoms. (Alcock, *loc. cit.*)

DERMATORUS, Alcock.

Dermatorus, ALCOCK, Ann. and Mag. Nat. Hist. (6th ser.), VI, 1890 (Oct.), 298.

Body compressed, with long, tapering tail. Head with well-developed muciferous cavities and numerous spiniferous bones. Snout compressed, with jaws coterminous in front. Eye of moderate size. Mouth very wide; villiform teeth in bands on the jaws and palatines, and few and scattered on the vomer. Gill-openings very wide. Branchiostegals, 8. Gills, 4. Gill-rakers well developed. Pseudobranchiæ quite rudimentary. Scales small, deciduous; lateral line undistinguishable. Ventral fins contiguous, each of a single simple filament. No pyloric cæca. No barbel. (*Alcock.*)

The type species, *D. trichiurus*, Alcock, is represented by a specimen 7 inches long, with the end of the tail missing, obtained by the *Investigator* at station 104, at a depth of 1,000 fathoms.

Another species, *D. melanocephalus*, was obtained from station 111, 1,644 fathoms, and station 117, 1,748 fathoms, mature females about 8 inches long. [Alcock, Ann. and Mag. Nat. Hist., 1891 (July), 32.]

NEOBYTHITES Goode and Bean.

Tetranematopus, GÜNTHER, MS.
Neobythites, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 600.—GÜNTHER, Challenger Report, XXII, 1887, 100.—VAILLANT, Exp. Sci. Travailleur et Talisman, 282, (discussion under *Bythites crassus*).

Brotulids having the body elongate, compressed, covered with small scales, and the head also scaled. Lateral line incomplete, obsolete posteriorly. Eye moderate. Snout moderate, rounded, slightly produced, the lower jaw slightly included. No barbel. Teeth villiform, in narrow bands in jaws and palatines. Vomerine teeth in V-shaped patch. Two weak spines at angle of preoperculum, and a stronger one at the angle of the operculum. Gill-openings wide, the membranes deeply cleft and not attached to the isthmus. Vertical fins united. Ventrals reduced each to a bifid ray. Branchiostegals, 8. Pseudobranchiæ present, but small. Air-bladder present. Type, *Neobythites Gillii*.

NEOBYTHITES GILLII, GOODE and BEAN. (Figure 289.)

Neobythites Gillii, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 601.—GÜNTHER, Challenger Report, XXII, 1887, 103.
Neobythites ocellatus, GÜNTHER, *loc. cit.* and Pl. XXI, Fig. B.

Body compressed, its height (17 millimeters) contained 4⅞ times in total length, and less than length of head. Interorbital area convex, its width (5 millimeters) equal to diameter of circular eye, 3⅝ in length of head and 1½ in length of snout in young.

Head compressed, deeper than broad, with wide sinuses, its length (18 millimeters) contained 4½ times in that of body; snout obtusely rounded, slightly produced. Mouth large, the maxillary extending considerably behind the vertical through posterior margin of eye, expanded posteriorly; the mandible still longer, its length (11 millimeters) about 2½ times in the height of the body. Interorbital space convex. Teeth in villiform bands in the jaws and on the palatines. Vomerine patch subcircular, with angles extended posteriorly.

Gill-rakers moderately long and slender, somewhat numerous, the longest about two-thirds the diameter of the eye; eleven developed and three rudiments below the angle. Pseudobranchiæ absent. Gill-opening wide, the membrane deeply cleft, free from the isthmus behind.

A single long, flat spine attached to the posterior portion of the operculum, high up, extending back along to its edge; a small hidden spine at lower angle of preoperculum.

Nostrils small, the anterior one in a very short tube, almost upon the tip of the snout; posterior nostril slightly larger, not tubular, immediately in front of middle of eye.

Scales moderate, upon head and on body, in 88 vertical rows, 7 rows between dorsal origin and lateral line, which becomes obsolete in its posterior half; 16 or 17 from vent forward to lateral line.

Dorsal origin behind that of ventral and pectoral. Its distance from snout (21 millimeters) contained 4 times in total length. Its rays moderately long. Anal origin under the eighteenth dorsal ray; its distance from snout (34 millimeters) contained 2½ times in body length. Rays rather slenderer than those in the dorsal. The caudal rays are 6 or 7 in number, their length (9 millimeters) contained 9 times in total length. They are not differentiated from those of the adjacent fins. Pectoral origin well forward, its base somewhat concealed by the flap of the operculum; its length (13 millimeters) about equal to two-thirds that of head. Ventrals each a bifid ray, the inner filament the longer, inserted slightly in advance of the base of the pectoral and not far from humeral symphysis, and reaching nearly to the vent. Its length (15 millimeters) nearly equal to height of body. Distance from origin of ventral to vent slightly greater than height of body.

Color, light yellow, with silvery reflections, with clouding of brown above lateral line and numerous black chromatophores; a series of irregular brown blotches above the lateral line, with one or two, much darker, extending up on the dorsal fin. In many specimens the color is uniform yellow, with simply the dark ocellæ showing.

The type (Cat. No. 37340, U. S. N. M.) was obtained by the *Albatross*, from station 2402, in 28° 36′ N. lat., 85° 33′ W. long., at a depth of 111 fathoms. The *Challenger* took it from station 122, off Pernambuco, Brazil, in 350 fathoms.

NEOBYTHITES MARGINATUS, Goode and Bean. (Figure 290.)

Neobythites marginatus, Goode and Bean, Bull. Mus. Comp. Zool., XII, 162.

Body compressed, somewhat elongate; its height (18 millimeters) contained 5⅞ times in its total length, and less than the length of the head. Interorbital area convex, its width (5½ millimeters) greater than the diameter of the circular eye, which is 4½ millimeters. The length of the head (22 millimeters) is contained 4⅝ times in that of the body. Mouth large, the maxilla extending considerably behind vertical through posterior margin of orbit; its length equals half that of the head. The length of the mandible (13 millimeters) is slightly more than two-thirds of height of body.

The teeth as in *N. gillii*.

Gill-rakers slightly longer than half the diameter of the eye, 7 and 3 rudiments below the angle of the anterior arch. Pseudobranchiæ absent. A long, flat spine upon the upper edge of the operculum, extending back nearly to its margin. Two short, flat spines upon the angle of the preoperculum. Nostrils as in *N. gillii*.

The scales small, very closely imbricated, in about 123 rows, 7 above and 29 below the lateral line.

The lateral line obsolete in its posterior half.

The dorsal is composed of 101 rays; its distance from the snout is contained 4 times in total length.

The anal originates under the fourteenth dorsal ray at a distance from the snout contained more than 2⅝ times in the total length.

The caudal consists of about 8 or 9 rays very closely placed; its length is contained about 10⅛ times in the total length.

The pectoral is placed much as in *Benthocometes*, its length about equal to 2⅛ times that of the head, extending to vertical through the vent.

The ventral, a bifid ray inserted in advance of base of pectoral, not reaching to the vent; its length (14 millimeters) considerably less than the height of body. The distance from its origin to the vent (19 millimeters) slightly more than the height of the body.

Color light yellowish brown, an obscure narrow band of darker brown commencing on the snout, interrupted by the eye, and extending backward two-thirds of the distance to the tail; another beginning on the snout, extending over the eye and back as far as the first described, interrupted posteriorly. Dorsal fin milky white at base in its anterior third; above this a blackish band extending the whole length of the fin. A narrow white margin above.

The type is from the *Blake* station LXXIX, off Barbadoes, 209 fathoms.

Neobythites macrops, Günther [*Challenger* Report, XXVI, 102, Pl. 10, Fig. A] is similar in proportions and general appearance, and is blotched in color, though in a different pattern. It is from *Challenger* station 173, off Matukee, Fiji Islands, at a depth of 310 fathoms, and from the *Investigator*, in Andaman Sea, in 265 to 271 fathoms.

In 1891 twenty specimens were taken in the Andaman Sea, *Investigator* station, 115, 188 to 220 fathoms. Their length varies from 4 to 8½ inches. [Alcock, *op. cit.*, 1891 (July), 30.]

NEOBYTHITES CRASSUS, (VAILLANT), GOODE and BEAN.

Bythites crassus, VAILLANT, Exp. Sci. Travailleur et Talisman, 279, pl. xxv, Fig. 1.

In general form resembling *Bythites fuscus*. The height of the body a little more than one-fifth of its length, and its thickness one-ninth; the length of the head is about two-elevenths of the length of the body; it is thick, with an inflated snout. Mouth moderately wide, the maxillary extending slightly beyond the vertical from the posterior limb of the orbit. Fine villiform teeth on the two jaws, the palatines and the vomer, and a few teeth upon the tongue. Eye small, its diameter about one-eighth the length of the head; interorbital space much greater, contained about two and three-fourths times in the length of the head. Branchial openings very wide. Branchiostegal membranes free from the isthmus. Opercula enveloped in thick skin, which obscures their outlines. Opercular spine distinct, strong, flattened; preoperculum probably obtusely denticulated, though hidden in the integument. Scales small, denticulate, extending upon the bases of the vertical fins and even of those of the pectorals, about 150 (?) in longitudinal series and 70 in vertical series. A lateral line parallel with the back about one-third of the distance from the dorsal to the ventral outline, indistinct posteriorly.

Origin of dorsal behind base of pectorals: the fin is low, its height hardly one-third that of the body, its base buried in the skin. The anal is similar to the dorsal, and begins immediately behind the vent. The caudal is confluent with the vertical fins. Pectoral short, about half as long as the head; rounded. Ventrals each of two rays, closely united at their base; the length of the inner one exceeds half the height of the body, the outer one three-fifths of the same.

Color, reddish-brown, deeper upon the fins. (*Vaillant.*)

A single specimen was obtained by the French expedition at station CXXXVI, at a depth of 4,255 meters.

BENTHOCOMETES, Goode and Bean, n. g.

Brotulids, similar in appearance and structure to *Neobythites* and *Bassogigas*, distinguished by two short, flat spines upon the anterior portion of the operculum, placed at some distance from each other, and by the absence of spines upon the preoperculum. The lateral line is complete, and extends without interruption to the posterior fourth of the body, where it becomes obsolete. The vomerine teeth are bunched in a circular patch instead of being arranged in triangular form. The head is comparatively short, with the jaws in front nearly equal; the snout not produced, but obtuse, rounded, and almost declivous in its outline.

Two species have been assigned to this genus—*Neobythites robustus*, Goode and Bean, and *Sirembo murænolepis*, Vaillant. The latter is not, as Vaillant supposed, related to *Diplacanthopoma*, which, though it has two spines upon the preoperculum, and is very similar in general appearance, has the ventrals single rather than double.

BENTHOCOMETES ROBUSTUS, GOODE and BEAN. (Figure 288.)

Neobythites robustus, GOODE and BEAN, Bull. Mus. Comp. Zool., XII, 161.

Body rather short and deep, its greatest height (16 millimeters) nearly 4⅘ in total length and about equal to length of head. The interorbital area is convex; its width (6 millimeters) is greater than the diameter of the circular eye (5 millimeters) and 1½ times the length of snout (4 millimeters). The length of the head (19 millimeters) is about 4 times the diameter of the eye. The mouth is moderate, the maxilla extending to the vertical through the posterior margin of the eye, the mandible a little beyond, its length (10 millimeters) equal to that of postorbital part of head. Teeth in villiform bands in the jaws and on the palatines. Vomerine teeth bunched in a circular patch. Gill-rakers moderate, the longest a little more than twice in diameter of eye, 4 above angle of first arch, 11 below. Pseudobranchiæ rudimentary. Gill-opening wide, the membrane deeply cleft, behind free from the isthmus. A pair of short flat spines upon the anterior portion of the operculum.

The nostrils are small, the anterior as close to the snout as the posterior ones are to the eyes. No apparent cirri. The scales are minute; the lateral line is obsolete on the last fourth of the length of the body.

The dorsal origin is behind that of the ventral and pectoral; its distance from the snout (24 millimeters) is contained $3\frac{5}{8}$ times in length of the body. The height of the fin is moderate; the longest ray is contained about 3 times in the length of the head.

The anal origin is under the eighteenth ray of the dorsal; the height of the fin about equals that of the dorsal. The vertical fins are not connate with the caudal, which consists of 12 or 13 very slender rays, its length nearly equal to half that of head.

The pectoral with a broad base, close to gill-opening, its length nearly two-thirds that of the head.

The ventral a single bifid ray, inserted in advance of the vertical through the base of the pectorals, and not far from the humeral symphysis. It reaches nearly half-way to the vent, the distance of which from the origin of the ventral is equal to the length of the head.[1]

Color, yellowish brown.

The type of this species, a specimen 88 millimeters in length, was taken by the *Blake* from station XCIV, off Moro Castle, Cuba, at a depth of from 250 to 400 fathoms. A collateral type specimen (Cat. No. 29057, U. S. N. M.) was obtained by the *Fish Hawk* from station 1043, in 38° 39′ N. lat., 73° 11′ W. lon., at a depth of 130 fathoms.

BENTHOCOMETES MURÆNOLEPIS, (VAILLANT), GOODE and BEAN.

Strembo murænolepis, VAILLANT, Exp. Sci. Trav. et Talisman, 273, pl. XXIII, Fig. 4, 4*a*.

This species does not appear to be very unlike the preceding, but without examination of the type we hesitate to pronounce it identical.

Two specimens were obtained by the French explorers at station LXIX, off the coast of Soudan, in 410 meters.

BASSOGIGAS, Gill.

Bassogigas, GILL, MS.

Brotulids having the body elongate, compressed, covered with a thick, heavy skin, which upon the head covers and obscures all the angles of the skull. Scales small, covering body and head completely. Lateral line indistinct for the greater part of its course, but apparently extending at least two-thirds of the way from the operculum to the tail. Eye moderate. Vertical fins completely united; ventrals a pair of bifid filaments inserted behind the humeral symphysis, and remote at their bases, short, rather stout. Snout without barbels, slightly produced, the lower jaw being barely included. Villiform teeth in the jaws, on the vomer and palatines; vomerine patch V-shaped, but with its arms broadly expanded and thicker at the angle, so that it is almost triangular. Operculum with a long, sharp spine; preoperculum unarmed. Branchiostegals eight. Air-bladder present. Pseudobranchiæ small.

B. pterotus (Alcock) = *Neobythites pterotus* (Alcock, Ann. and Mag. Nat. Hist., 1889, II, 210) is characterized by long feathery peduncles reaching beyond the vent. One specimen was taken by the *Investigator* at station 97, in the Bay of Bengal, at a depth of 1,310 fathoms.

Neobythites stelliferoides, Gilbert, obtained by the *Albatross* in 712 fathoms off the west coast of Lower California, is perhaps not remotely related to this genus.

BASSOGIGAS GILLII, GOODE and BEAN, n. s. (Figure 291.)

Head rather short and broad, with snout slightly overlapping the lower jaw. Diameter of the eye scarcely one-third of the length of the snout, and about one-twelfth of that of the head; the maxillary extending far behind the eye, the vertical from the anterior margin of the orbit nearly bisecting it; its length half that of the head, and its posterior margin ending in a broad, triangular dilation. Teeth normal. Anterior and posterior nostrils separated by a space greater than the diameter of the eye. Preoperculum with a square, rounded angle; no armature; operculum with a strong, sharp spine above, the tip of which projects slightly beyond the opercular flap. Distance of the vent from the root of the pectoral slightly more than the length of the head; as far removed from this point as is the anterior nostril.

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[1] In one of the *Albatross* specimens the pectoral extends to the vertical from the eighth ray of the second dorsal.

Scales moderate, covering the entire head. Lateral line somewhat conspicuous, obsolete in its posterior third.

The dorsal and anal fins enveloped in thick, scaly skin. The origin of the dorsal is in advance of the middle of the pectoral. Pectorals rounded, broad, and very short; less than half as long as the head, and extending about half the distance from their origin to the vertical from the vent. Ventrals inserted somewhat behind the angle of the preoperculum, and extending to the vertical from the axil of the pectoral, and about one-fourth of the distance from their origins to the vent; each ventral filament is bifid, the inner part being the longer.

Radial formula: Vertical fins, 83+6+67.

Color, uniform grayish-brown; fins darker.

The type was obtained by the *Albatross* from station 2684, off Cape Henlopen, Delaware, in 39° 35′ N. lat., 70° 54′ W. lon., at a depth of 1,106 fathoms.

This form resembles so closely the figure of *Neobythites grandis*, Günther, (Chall. Rep. XXII, 100, pl. XXI, fig. A), that the species was provisionally identified as the same, but a more careful study shows that it differs in certain particulars, especially in the more distinct lateral line, the rather shorter body, and the fact that the vent is considerably farther back (more than twice the length of the pectoral from the gill opening), while the ventrals do not reach more than one-fourth of the way to the vent. The rays in the vertical fins will probably be found to be fewer, though Günther has not enumerated those in his type.

ALCOCKIA, Goode and Bean, n. g.

Brotulids resembling *Neobythites* in the general form of the body, with no continuous lateral line, though traces can be distinguished at various parts of the body, and with a head and snout similar in appearance to those of *Bassozetus*, though the former is peculiarly shaped. Bones of the head rather thin, with large, somewhat conspicuous sinuses. Sharp, well-developed spines upon the operculum and preoperculum (which has a crenulated margin), behind the eye, upon the superciliary crest, and behind the posterior nostril, which is separated from the orbit by a short, spinous projection, as in *Bathybrotula*. Muciferous channels ample, that of the frontal bone opening in front by a wide aperture on each side of the rostral projection, and each mandibulary canal opening in front immediately behind the symphysis by a slit in the skin. The mucous membrane of the nasal cavity in two folds, forming together a longitudinal pad with a linear base. Teeth in villiform bands on jaws, vomer, and palatines; the vomerines open V-shaped and much narrower than the palatine band. Pectorals narrow and feeble. Ventrals each composed of two filaments, short, very feeble and close together, inserted on isthmus, some distance from symphysis. Scales cycloid, persistent, irregular. Gill-laminæ short; gill-rakers stiff, far apart, and but few in number. Branchiostegals 8. Pseudobranchiæ represented by two or three small lobes.

This genus is provisionally proposed for the *Porogadus rostratus* of Günther (Challenger Report, XXII, 1887, 113, pl. XXIV, fig. B) obtained by the *Challenger* from station 198, north of Celebes, at a depth of 2,150 fathoms.

The genus is named in honor of A. Alcock, M. B., surgeon-naturalist to the H. M. Indian marine survey steamer *Investigator*, who has made so many important additions to our knowledge of the bathybial fauna of the Indian Ocean.

CELEMA, Goode and Bean, n. g.

Brotulids closely resembling in appearance *Mæbia*, though with the rays of the vertical fins apparently less abbreviated on the posterior part of the caudal finlet, and without the short row of specialized large scales beginning above the angle of the gill-opening. Head very cavernous, with the sinuses very conspicuous in preserved specimens, and with numerous, rather strong spines upon the upper part of the opercular apparatus and the head. Teeth on jaws, vomer, and palatines. No traces of scales upon the head. Character of lateral line unknown. Dorsal beginning somewhat behind the vertical from the axil of the pectoral. Anal close to the vent; its distance from the base of the pectoral is about equal to the length of the head. Pectorals broad, very feeble. Ventrals feeble and short, each composed of two rays, the inner one the more abbreviated.

This genus is provisionally proposed for the reception of the two species referred by Vaillant to our *Porogadus*, to which they evidently do not belong, being separated not only by the structure of the head and the shape of the body, but by the absence of the triple row of pores, which replace the lateral line in that genus and *Penopus*. The characters presented are gleaned from the descriptions of Vaillant, and are. in the absence of specimens, offered only as tentative.

CELEMA NUDA, (VAILLANT), GOODE and BEAN.

Porogadus nudus, VAILLANT, Exp. Sci. Travailleur et Talisman, 262, pl. XXIV, figs. 2–2*b*.

Body much elongated, its height one-twelfth, and its thickness one-fifteenth of its length. Length of head one-seventh of that of body; in the specimen as preserved in spirits it is rough, bristly with spines, and has a median crest (the position of these is described at length by Vaillant, but is sufficiently well indicated in the figure). Snout round, flat, its length two-sevenths that of the head. The mouth large, the maxillary passing considerably behind the eye. Teeth very fine, in villiform bands upon the jaws, vomer, and palatines. Eye conspicuous, its diameter one-fifth the length of the head and equal to the width of the interorbital space. Suborbital distinct, rough. Branchial opening very wide. Preoperculum with a double margin, each portion of which has three obtuse spines; operculum with a single spine. No scales upon the head, the mucous sinuses being very much developed, particularly in the suborbitals and on the margin of the preoperculum Caudal peduncle large, attenuated, nearly filiform posteriorly. Vent a little in front of the limit of the anterior third of the body, and at a distance from the origin of the ventrals greater than the length of the head. Dorsal origin a little behind the base of the pectorals. Anal origin immediately behind the vent. These fins are moderately high, and confluent with the caudal, which is not very long. Pectorals moderate, their length a little more than two-thirds that of the head. Ventrals a little longer than the pectorals, the inner ray slightly shorter than the outer one. Scales almost entirely absent, a few visible in the vicinity of the branchial opening. No trace of lateral line distinguishable.

Color rosy-white, with the lower parts of the body, sides of head, and the opercular region bluish-black.

Three specimens were obtained by the French expedition at station XCVIII, on the Banc d'Arguin, at a depth of 2,324 meters, and at station CI, off the Cape Verde Islands, at 3,200 meters.

CELEMA SUBARMATA, (VAILLANT), GOODE and BEAN.

Porogadus subarmatus, VAILLANT, Exp. Scient. Travailleur et Talisman, Poissons, 265, pl. XXIV, figs. 3–3*c*.

A species closely allied to *C. nuda*, but with a shorter head, its length only one-eighth that of the body. Interorbital space wider, its width being two-ninths of the length of the head, and a little more than the diameter of the eye, which is contained in the length of the head only 5½ times. The head is less spinous. The space between the ventrals and the vent a little greater than the length of the head. Scales very deciduous, and lacking on almost all the specimens studied. Vaillant describes the form of one which he found near the opercular opening, evidently an intracutaneous cycloid scale.

Color like that of *C. nuda*, the opercular flap and the abdomen presenting a blackish tint on account of their transparency, the mucous membranes within being exceedingly dark.

Eleven specimens were taken by the French expedition at station CI, off the Cape Verde Islands, at a depth of 3,200 meters. They were evidently spawning, for red eggs were protruding from the abdomen.

MŒBIA, Goode and Bean, n. g.

Brotulids resembling *Bassozetus* in general form, excepting that the tail is prolonged in a very slender filament, the dorsal and anal rays being extremely short posteriorly, but positively confluent with the caudal rays, which are much longer and much exserted. Ventrals each bifid, instead of a single ray as in *Bassozetus*. Head very cavernous, the sinuses large and conspicuous on the infraorbital ring, on the mandible, and the preoperculum. A single, short, feeble spine on the shoulder, but none upon the operculum or preoperculum, though certain projections seem to show above the eye, doubtless due to the shrinkage of the integument upon the underlying projections of bone. Mouth very wide, the extremity of the maxillary much dilated. Posterior nostrils very wide, and separated from the eye by a small, spinous projection of bone. Teeth in narrow bands, that on the vomer V-shaped with the two arms straight. A few very large scales in a row starting from the upper angle of the gill-opening and terminating over the axil of the pectoral. Gill-rakers on outer arch rather numerous, long and slender. Pseudobranchiæ represented by two minute globules.

This genus is founded upon *Bathynectes gracilis* of Günther (Ann. and Mag. Nat. Hist. 1878, II, 21; Challenger Report, XXII, 112, pl. XVI, fig. B), provisionally referred by Günther to our genus *Porogadus*.

It is named in honor of Prof. Karl Mœbius, Director of the Royal Zoological Museum in Berlin, who has added much to our knowledge of marine life by his noble work *Die Fauna der Kielerbucht*, and by numerous other writings.

It is but right to say that at the time its reference was made, no figure of *Porogadus* had been published, and some of the most salient characters, which we tried to bring out prominently in our generic diagnosis, seem not to have been sufficiently emphasized, so that both Dr. Günther and Dr. Vaillant were misled as to the real affinities of our species *Porogadus miles*, the type of the genus.

Mœbia gracilis was obtained by the *Challenger* at station 184, south of New Guinea, at a depth of 1,400 fathoms.

BARATHRODEMUS, Goode and Bean.

Barathrodemus, GOODE and BEAN, Bull. Mus. Comp. Zool., x, 1883, 200.—JORDAN, Cat. Fish. N. Amer., 1885, 127.—GÜNTHER, Challenger Report, XXII, 1887, 99.

Brotulids with body much compressed, elevated; head considerably compressed, with mouth moderate (in the type species extending to the vertical through the middle of the eye). Eye moderate. Head spineless, except a short flattened spine at the upper angle of the operculum. Snout long, projecting far beyond the tip of the upper jaw, its extremity much swollen. Jaws nearly equal in front. Teeth minute, in villiform bands on jaws, vomer, and palatines. Barbel, none. Anterior pair of nostrils open and situated at the outer angles of the dilated snout, circular, each surrounded with a cluster of mucous tubes. Posterior nostrils near anterior upper margin of orbit. Gill openings wide, membranes not united. Gills 4, with a slit behind the fourth; gill laminæ moderate in length. Gill-rakers also moderate; not numerous. Pseudobranchiæ absent; caudal fin not connate, but without distinct peduncle.

Dorsal and anal fins long. Branchiostegals, 8. Body and head covered with small, thin scales, those on the body scarcely imbricated. Lateral line absent. Ventrals a pair of bifid rays close together, on the isthmus.

BARATHRODEMUS MANATINUS, GOODE and BEAN. (Figure 294.)

Barathrodemus manatinus, GOODE and BEAN, Bull. Mus. Comp. Zool., X, 1883, 200.—JORDAN, Cat. Fish. N. Amer., 1885, 127.—GÜNTHER, Challenger Report, XXII, 1887, 99.

Body much compressed. Dorsal and anal outline approaching at an equal angle the horizontal axis. The height of the body is contained 7½ times in its total length without caudal, and 8¼ times with caudal included. Scales small; about 175 rows between the branchial opening and the tail; and about 34 rows, counting upward and forward obliquely from the origin of the anal to the dorsal line. Lateral line apparently absent.

Head considerably compressed, with rounded upper surface, its length contained about six times in total body length; its width contained 2½ times in its length; its greatest height equals two thirds its length. Snout slightly longer than the horizontal diameter of the eye, and projecting beyond the tip of the upper jaw a distance equal to the vertical diameter of the eye; much dilated and swollen, the anterior pair of nostrils being situated at the most salient angles; the snout in general form resembling that of a manatee, whence the specific name.

Mouth moderate; its cleft extending to the vertical from the center of the orbit. Length of the the upper jaw equal to twice the horizontal diameter of the eye, and contained 2½ times in the length of the head. The posterior portion of the maxilla is considerably expanded. The maxilla is largely included within a skinny sheath. When the mouth is closed, the lower jaw is entirely included within the upper. Vomer and palatine with bands of teeth more than twice as broad as the bands in the intermaxillaries and on the mandible.

Eye elliptical in form. Its vertical diameter two-thirds of its horizontal, the latter being equal to the distance from the tip of the snout to the posterior nostril, and contained 5½ times in the length of the head. The distance of the eye from the dorsal outline is equal to half its horizontal diameter, and to one-fifth of the height of the head in a perpendicular through the center of the eye. Interorbital space rounded; its width equal to the horizontal diameter of the eye.

Dorsal fin inserted in the vertical above the insertion of the pectoral, at a distance from the end of the snout equal to that of the insertion of the pectoral.

Anal inserted under the twenty-first to twenty-third dorsal ray, and at a distance from the snout about equal to one-third the body length. The height of the dorsal and anal fins is about equal to half the height of the body at the insertion of the anal. Their bases extend almost to the insertion of the caudal.

The caudal is composed of 9 rays, the 5 medial ones almost equal in length, though the tip of the tail is slightly rounded, about equal to the height of the body midway between the branchial opening and the base of the tail.

The ventrals are inserted almost under the middle of the operculum; in length about equal to half the length of the head.

The pectorals are inserted under the origin of the dorsal, and at a distance behind the branchial opening equal to two-thirds the vertical diameter of the eye. The length is equal to the greatest height of the body.

Radial formula: D. 106; A. 86; C. 2+5+2; P. 18–20; V. $\frac{1}{1}$.

Scales in lateral line about 175.

Color, grayish brown, abdominal region black.

The types of this species, 6¼ inches in length, were obtained by the *Blake* at station CCCXXV, in 33° 35′ 20″ N. lat., 76° W. lon., at a depth of 647 fathoms. The *Albatross* also secured examples from station 2105, in 37° 50′ N. lat., 73° 03′ 50″ W. lon., at a depth of 1395 fathoms; and from station 2116, in 35° 45′ 23″ N. lat., 74° 31′ 25″ W. lon., at a depth of 888 fathoms.

PYCNOCRASPEDUM, Alcock.

Pycnocraspedum, ALCOCK, Ann. and Mag. Nat. Hist., Nov., 1889, 386.

Head large, body compressed, both covered entirely with small, thin, smooth, rather deciduous scales. Head-bones and opercles spineless. Snout short, broad, and not overhanging the jaws, which are equal in front. Eye of moderate size. Mouth very large; teeth in villiform bands in the jaws, palatines, and vomer. No barbel. Gill-openings wide, gill-membranes entirely separate; 4 gills; 8 branchiostegals; no pseudobranchiæ. Lateral line incomplete on the tail. Vertical fins invested with thick, scaly skin. Caudal free, united with the vertical fins at its extreme base only. Pectoral fins entire. Ventral fins in the form of bifid filaments.

The type and only species is *P. squamipinne*, Alcock (*loc. cit.*), taken in 193 fathoms in the Bay of Bengal, in lat. 20° 17′ 30″ N., lon. 88° 50′ E.

NEMATONUS, Günther.

Nematonus, GÜNTHER, Challenger Report, XXII, 1887, 114 (type, *Bathyonus pectoralis*, Goode and Bean).

Body compressed, with long, tapering tail. Bones of head soft, muciferous channels moderately developed, and with integument very thin or absent on the upper portion and snout. Operculum cartilaginous and flat; a broad process near its upper angle corresponding to the opercular spine in some of the related genera; the head otherwise unarmed, though irregular by reason of the bareness of the cranial bones. Snout much depressed, broad, rounded. Jaws equal in front; mouth very wide; bands of villiform teeth in jaws, on vomer and palatines. Barbel none. Eyes small. Vertical fins confluent; ventrals a pair of bifid filaments close together, on the isthmus, close to the humeral symphysis. Gills four, with very short laminæ and rather short, incurved, acicular gill-rakers on the first arch, and much shorter, less numerous, spatulate ones upon the three other arches. Pseudobranchiæ rudimentary. No traces of a lateral line, though the body is covered with scales of considerable size, almost as large as the eye, and the cheek with others still larger.

Nematonus differs from *Porogadus* not only in the absence of spines upon the head, as Günther has indicated, but in the much less ossified opercular apparatus, in the shorter and thicker head, in the absence of the three series of pores simulating lateral lines, and in the tendency to prolongation in the lower rays of the pectoral, which increase from the uppermost to the lowermost in *Nematonus*, while *Porogadus* has a lanceolate fin, and also in the extreme exsertion of its caudal rays.

NEMATONUS PECTORALIS, (GOODE and BEAN), GÜNTHER. (Figure 295.)

Bathyonus pectoralis, GOODE and BEAN, Proc. U. S. Nat. Mus., 1885, VIII, 604.
Nematonus pectoralis, GÜNTHER, Challenger Report, XXII, 1887, 114.

Body moderately elongate, much compressed, the tail much shorter and more robust than in *Bassozetus catena*. Its height (26 millimeters) equals 1⅓ times the length of the head and one-seventh that of the body.

Head stoutish, not much compressed, lower than body, its length (34 millimeters) contained 5½ times in the body length. Snout compressed, broad at its tip, its length (6 millimeters) exceeding the diameter of the circular eye (5 millimeters). Interorbital area slightly convex, its width (11 millimeters) slightly exceeding twice the diameter of the eye, 3 times in length of head.

Maxilla extending far behind the eye, its length (19 millimeters) less than that of preorbital portion of head. Mandible as long as postorbital portion of head (22 millimeters). Jaws, vomer, and palatines, with narrow bands of villiform teeth, normally arranged. Branchiostegals 8. Gill-lamellæ very short. Gill rakers long and numerous, 18 on first arch below the angle, 5 above, 4 of which are rudimentary. Pseudobranchiæ present, but very rudimentary.

Anterior nostrils on the top of the snout and near the median line of the head, near its tip, separated by a space about equal to the diameter of the eye. Posterior nostrils in front of the eye.

Muciferous pores large, arranged much as in *B. catena.*

Dorsal origin in the same vertical with that of the pectorals, its distance from the tip of the snout (38 millimeters) contained 5 times in total and equaling twice the length of the maxilla. Rays well developed in the anterior third, the longest two-thirds of head's length.

The anal origin is under the twentieth dorsal ray; its rays are nearly as long as those of the dorsal. The pectoral has its penultimate ray produced, extending to the thirteenth ray of the anal; it is nearly twice as long as the head. Ventrals originating in advance of the vertical through the pectorals, and each a bifid filament. Distance of the ventral origin from tip of snout (26 millimeters) equaling length of ventral and about three-fourths as long as the head. Distance of origin of ventral from vent (42 millimeters) considerably greater than length of head. Distance from tip of ventral to vent equal to half the length of the head.

Number of scales in transverse series from vent to dorsal about 23; from the upper angle of the gill-opening to the vertical through origin of anal, 32.

Color, brownish yellow. Head and abdomen blackish.

Radial formula: D. 93; A. 73; P. 17; V. 2.

The type (37342, U. S. N. M.) was taken at *Albatross* station 2380, N. lat. 28° 02′ 30″, W. lon. 87° 43′ 45″, 1,430 fathoms. It is 183 millimeters long to caudal base, 215 with caudal. Another young specimen 70 millimeters long was taken at *Blake* station, XCV, off Dominica, 330 fathoms.

POROGADUS, Goode and Bean.

Porogadus, GOODE and BEAN, Proc. U. S. Nat. Mus., 1885, VIII, 602.—GÜNTHER, Challenger Report, XXII, 1887, III.

Body brotuliform, much compressed. Head with numerous spines on interorbital space, two pairs on the shoulders, one at angle of operculum, and a double series on angle of preoperculum. Head with numerous mucous pores, as in *Bassozetus.* Mouth large. Snout moderate, not projecting much beyond upper jaw.

Jaws nearly equal in front. Teeth in villiform bands in jaws and on vomer and palatines. Barbel none.

Gill-openings wide, membranes narrowly united, not attached to the isthmus. Gills 4. Gill-laminæ short. Gill-rakers moderate, numerous. Pseudobranchiæ absent. Caudal fin of few rays, on a very narrow base, not prolonged, scarcely differentiated from the vertical fins. Dorsal and anal fins well developed. Pectorals simple, moderate. Each ventral a single bifid ray, close to the humeral symphysis. Branchiostegals 8. Scales small. Lateral line apparently triple, or replaced by three series of pores, one close to ventral outline, one median, and another along base of dorsal.

Type, *Porogadus miles*, Goode and Bean.

POROGADUS MILES, GOODE and BEAN. (Figure 292.)

Porogadus miles, GOODE and BEAN, Proc. U. S. Nat. Mus., 1885, VIII, 602.—GÜNTHER, Challenger Report, XXII, 1887, 113.

Body much compressed, elongate, tapering to a very slender tail, its height (15 millimeters) nearly 10 times in total length.

Head long, moderately compressed, subconical; the profile gradually ascending in nearly a straight line from the tip of the snout to the origin of the dorsal. Its length (23 millimeters) 6½ times in that of body. Interorbital space slightly convex, spiny, its width (15 millimeters) 4⅗ times in length of head, and slightly greater than diameter of eye.

Eye oval, its greatest diameter (4 millimeters) 5¾ times in length of head. Opercles and head generally covered with numerous and strong spines, as described in the generic diagnosis.

Mouth very large and wide. The maxilla extending far behind the eye and much expanded at its tip; its length (13 millimeters) more than half that of head. Length of mandible (15 millimeters) equal to greatest height of body. Jaws, vomer, and palatines with narrow bands of villiform teeth, none of which are enlarged. Gill-rakers, 15 on anterior arch below the angle, 3 rudimentary ones above.

The anterior pair of nostrils are nearly on top of the snout, and somewhat nearer to its tip than to the eye, separated by a very narrow space, and placed immediately in front of the middle of the eye. Behind each posterior nostril is a strong spine projecting outward and backward. Pores of the head arranged much as in *Bassozetus*.

Scales minute. Lateral line not clearly to be made out. Three rows of minute pores on each side dorsal, median, and ventral, beginning near the head and extending well toward the extremity of the tail.

Dorsal origin slightly behind vertical through pectoral base; its distance from the snout (25 millimeters) nearly 6 times in length of body. Its rays are moderately long, the longest about as long as the snout (one-fourth of head), and very numerous.

Anal origin in vertical from twenty-second or twenty-third dorsal ray; its distance from the snout (44 millimeters) 3½ times in length of body. Its rays about as long as those of the dorsal.

Pectoral imperfect, its length in the type equals one-half that of the head.

Ventral a bifid filament, placed close to the humeral symphysis, well in advance of the pectoral; its length (15 millimeters) equal to height of body. Distance from origin of ventrals to vent (22 millimeters) nearly equal to length of head. The ventral does not reach to the vent by a distance equal to length of snout.

Color, blackish brown.

The type (No. 35625, U. S. N. M.) is 153 millimeters in length; it is from *Albatross* station 2230, N. lat. 38° 27′, W. lon. 73° 02′, at a depth of 1,168 fathoms.

PENOPUS, Goode and Bean, n. g.

Body stout in front, tapering behind. Tail not greatly exceeding the length of the rest of the fish. Head scaly, thick, its top surface flat, with depressed and moderately projecting snout. A pair of minute postnasal spines; a strong and much curved spine on the operculum; several weak spines at the angle of the preoperculum, and several at the posterior angle of the suboperculum. Mouth moderately large, the lower jaw included.

Several narrow slit-like pores along the margin of the preorbital and suborbital. Two minute pores on the under surface of the mandible near its symphysis, and not far behind them two long slit-like pores.

The anterior nostril is in a long slit, the posterior is larger, oblong in shape, and half concealed by a fold of skin. Eye small. The teeth appear only as minute asperities; the intermaxillary band much wider in front than behind. Mandibulary band narrow throughout. Vomerine band very narrow V-shaped. Palatines in a long broad band. Gill-openings wide, deeply cleft in front, narrowly joined to the isthmus. Branchiostegals 8. No pseudobranchiæ. The gill-rakers are long and slender; not numerous. Gill-laminæ moderately long. A long slit behind the fourth gill. Scales very small. Lateral lines, three. Caudal fin consisting of few rays, well differentiated from the dorsal and anal. Dorsal beginning not far behind the head. Ventrals slightly in advance of the pectorals and composed of two rays, united by membrane, which forms a margin around them.

Pectoral normal; several of its upper rays simple. The vent is not much in advance of the middle of the total length.

This genus agrees with *Porogadus* in nearly every respect except in the scarcity of spines on the head and in the structure of the ventrals. *Porogadus* has the ventrals composed of two distinct rays which are separated throughout their entire length, but in *Penopus* the two rays are inclosed in a membrane which connects them and forms a margin around them. In *Porogadus*, also, the suboperculum has a smooth margin and the opercular spine is weaker than in *Penopus*, and it is not curved.

PENOPUS MACDONALDI, GOODE AND BEAN, n. s. (Figure 293.)

The greatest height of the body (35 millimeters) equals the length of the postorbital part of the head and about one-ninth of the total without the caudal. The greatest width of the body anteriorly is about two-thirds of its greatest height. The head is stout, its greatest width equaling three-fourths of its greatest depth and more than one-third of its length. The width of the interorbital space (14 millimeters) is about one-fifth the length of the head. The eye is very small, its length (6 millimeters) less than one-half the width of the interorbital space. The distance from the eye to the tip of the snout (24 millimeters) equals the length of the intermaxilla. The distance of the anterior nostril from the tip of the snout equals the length of the eye. The distance of the posterior nostril from the eye is slightly less than its distance from the tip of the snout. The maxilla is expanded behind and reaches somewhat behind the eye; its length (25 millimeters) equals the length of the snout. The mandible extends much behind the eye, its length (36 millimeters) equal to postorbital part of head. The dorsal begins over the middle of the pectoral; its rays are well developed, those in the middle of the fin longer than the anterior ones. It contains 137 rays. The anal begins under the twenty-seventh ray of the dorsal; it contains 102 rays, those about the middle of the fin longest. The length of the pectoral (32 millimeters) is nearly one-half the length of the head and about equal to the distance of its tip from the vent. The length of the ventral (27 millimeters) is about one-third of the distance of its origin from the origin of the anal.

Lateral lines, three; the uppermost beginning at the upper angle of the gill-opening quicky approaching the top of the body near the base of the dorsal and merging into the dorsal base about the middle of the tail; the median lateral line begins a little behind the head and extends almost to the root of the caudal, becoming very faint posteriorly. The lowermost lateral line has its origin under and not far from the base of the pectoral. It extends along the lower side of the tail and merges into the base of the anal fin somewhat beyond the middle of the length of the tail.

Color, yellowish brown; operculum, opercular flap and branchiostegal membrane, pectoral, and ventral dusky.

The single specimen obtained is 315 millimeters long, catalogue number 39433. It was obtained by the steamer *Albatross*, September 18, 1886, at station 2716, N. lat. 38° 29′ 30″, W. lon. 70° 57′, in 1,631 fathoms.

ACANTHONUS, Günther. (Figure 296, A.)

Acanthonus, GÜNTHER, Ann. and Mag., Nat. Hist., 1878, II, 22; Challenger Report, XXII, 116.

Head excessively large and thick, armed in front and on the opercles with strong spines; trunk very short, the vent being below the pectoral, tail thin, strongly compressed, tapering, with the caudal distinct. Eye small. Mouth very wide, with the teeth in villiform bands in the jaws, on the vomer, and palatine bones, and along the hyoid. Barbel none. Ventrals each reduced to a bifid filiment, placed close together on the humeral symphysis. Gill-membranes not united. The gill-laminæ are remarkably short; the gill-rakers long, lanceolate, stiff. Scales extremely small. Bones of the head soft, the superficial ones supporting large cavities. (*Günther.*)

The genus is represented by a single species found by the *Challenger* in 1,050–1,070 fathoms in the Middle Pacific, station 205, off the Philippines, and station 218, north of New Guinea. The type species is *A. armatus*, Günther, Challenger Report, XXII, 117, pl. XXIV, Fig. A.

TAUREDOPHIDIUM, Alcock. (Figure 296, B.)

Tauredophidium, ALCOCK, Ann. and Mag. Nat. Hist. (6), VI., 1890, 212. (Type, *T. Hextii, loc., cit.*, pl. VIII, fig. 1.)

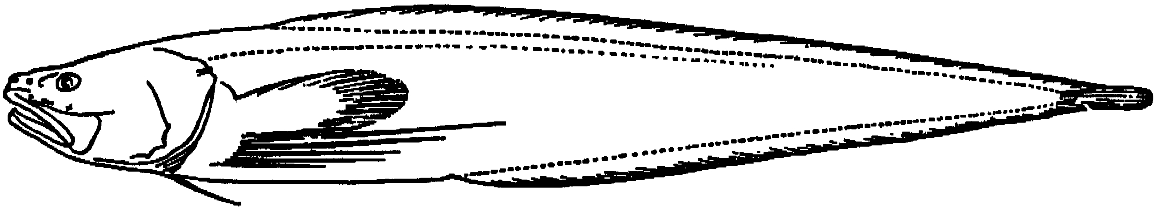
Head large and thick, armed on the opercles with strong spines; body compressed. Snout broad, not overhanging the large mouth. Eyes, none. No barbel. Villiform teeth in the jaws, vomer, and palate. Gill-membranes rather broadly united; 4 gills; 8 branchiostegals; no pseudobranchiæ. Small, deciduous scales on body and head; lateral lines indistinguishable. Vertical fins confluent; pectorals entire; ventrals widely separated, each consisting of two filaments.

This genus is known from a single species taken in the Bay of Bengal, off the Madras coast in 1,310 fathoms,—*T. Hoxtii*, Alcock (Ann. and Mag. Nat. Hist., 1890, VI, 213., pl. VIII, fig. 1) from *Investigator* station 97.

PTEROIDONUS, Günther.

Pteroidonus, GUNTHER, Challenger Report, XXII, 1887, 106.

The lower pectoral rays are incompletely united with the upper part of the fin and are prolonged. Body elongate, compressed, covered with small scales; lateral line incomplete, close to the dorsal profile. Head oblong, thick, covered with scales. Eye small. Vertical fins united, but the narrow caudal projecting beyond the short anal and dorsal rays. Ventrals reduced to a simple filament, inserted behind the humeral symphysis, and somewhat distant from each other. Snout broad with rounded profile, including the lower jaw, without barbel. Mouth wide; bands of villiform teeth in the jaws, on the vomer, and palatine bones. Operculum with a straight spine; preoperculum armed. Eight branchiostegals. Gill-laminæ rather short; gill-rakers rather long, lanceolate and widely set; pseudobranchiæ none. (*Günther.*)



PTEROIDONUS QUINQUARIUS.

This genus is represented by a single specimen, of a species called by Günther, *Pteroidonus quinquarius* (*loc. cit.*), Pl. XXII, Fig. B, 14½ inches long, obtained by the *Challenger* off the coast of Japan (station 235), at the depth of 565 fathoms.

DICROLENE, GOODE and BEAN.

Dicrolene, GOODE and BEAN, Bull Mus. Comp. Zoöl., x, 202.—GÜNTHER, Challenger Report, XXII, 1887, 107

Brotulids with body moderately compressed; head somewhat compressed, with mouth large (in the type species extending nearly to the posterior margin of the eye). The tip of the maxillary much dilated. Eye large, placed close to the dorsal profile. Head with supraorbital spines; several strong spines on the preoperculum, and one long spine at the upper angle of the operculum. Snout short, not projecting beyond the upper jaw. Jaws nearly equal in front. Teeth in narrow villiform bands in the jaws, on the head of the vomer, and on the palatines. Barbel none. Gill-openings wide; membranes not united. Gills four; gill laminæ of moderate length. Gill-rakers rather long, not numerous. Pseudobranchiæ absent. Caudal not confluent, but without a distinct peduncle. Dorsal and anal fins long. Pectoral rays arranged in two groups, several of the lower ones being separate and much produced. Ventral fins close together on the isthmus, a pair of bifid rays. Branchiostegals eight. Body and head covered with small scales. Lateral line close to the base of the dorsal fin, apparently becoming obsolete on the posterior third of the body. Stomach siphonal. Pyloric cæca few, rudimentary. Intestine shorter than body.

Paradicrolene, Alcock (Ann. and Mag. Nat. Hist., 1889, 387), is so close to *Dicrolene* that we are unable to distinguish it. It is represented by a single species, *D. multifilis* (Alcock), *loc. cit.*, from the Bay of Bengal, 193 fathoms, lat. 20° 17′ 30″ N., lon. 88° 50′ E., and from the Andaman Sea, east of Port Blair, 271 fathoms, and off the Coromandel coast.

Alcock states that in young individuals the lower (free) rays are very much less clearly separated from the rest of the fin and from each other than in the adults. (Ann. and Mag. Nat. Hist., 1872, 348.)

Another species, *D. nigricaudis*, was obtained from the Andaman Sea, *Investigator* station 115, in 188 and 120 fathoms. (Ann. and Mag. Nat. Hist., 1891, July 31.)

Alcock has also identified a third species, taken in the Laccadive Sea, with the form described and figured by Vaillant as *Dicrolene intronigra*, Goode and Bean, proposing for it the name *Paradicrolene Vaillantii.* (Ann. and Mag. Nat. Hist., 1890 (Oct.), 297). We are of the opinion that Vaillant's fish and ours are conspecific.

The erroneous printing of "7" for "8" in our description of the branchiostegals of *Dicrolene* has unfortunately misled Mr. Alcock.

DICROLENE INTRONIGRA, GOODE and BEAN. (Figure 297, 297 A, B.)

Dicrolene intronigra, GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 1883, 202.—GÜNTHER, Challenger Report, XXII, 1887, 107.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 258, pl. XXIII, fig. 2.

Body moderately compressed, its dorsal and anal outlines approaching at an equal angle the horizontal axis, and tapering to a narrow point, which forms the base of the caudal fin. Scales small, about 110 rows between the branchial opening and the tail, and about 27 transverse rows counting upward and forward obliquely from the origin of the anal. The lateral line rudimentary, running near the base of the dorsal fin at a distance from it less than the diameter of the eye, and apparently becoming obsolete on the posterior third of the body. Body height one-sixth of standard length.

Head somewhat compressed, with flattish upper surface, which is encroached upon by the upper margins of the orbit. At the posterior upper margin of each orbit is a strong spine pointing backward and upward; a long sharp spine at the upper angle of the operculum, its exposed portion as long as half the diameter of the eye. Preoperculum, on its lower posterior border, with three equidistant spines, much weaker than that of the operculum. Large muciferous cavities in the bones of the head; a row of large cavities extending backward from the upper angle of the orbit, and continuous with those on the lateral line. Mouth large, its cleft considerably longer than half the length of the head, and the maxillary extending behind the vertical from the posterior margin of the orbit. The posterior portion of the maxillary much expanded, its width at the end equal to three-fourths the diameter of the eye. Upon its expanded tip are scales. Eye large, one-fourth as long as head, and as wide as the interorbital space. Length of head one-fifth standard length.

Dorsal fin inserted at a distance from the snout equal to two-ninths the length of the body.

Anal inserted under the vertical from the twenty-fifth or twenty-sixth dorsal ray. The height of the dorsal and anal fins is about equal to the diameter of the eye. Their bases extend almost to the insertion of the caudal.

The caudal is composed of 6 or 7 rays; its length equal to half the distance from the snout to the insertion of the dorsal.

The ventrals inserted almost under, but slightly posterior to, the posterior limb of the preoperculum, in length about equaling the upper jaw.

Pectorals inserted close to the branchial aperture; the eight lower rays being free and much prolonged, the longest and most anterior being nearly one-third as long as the body, and more than three times as long as the contiguous posterior ray of the normally constructed portion of the fin, which is, however, about equal to the last of the free rays. The free portion of the pectoral being longer and composed of fewer rays than the normal portion, the fish has the appearance of bearing two pectoral fins of the same general shape, the lower of which is the longer. The length of the normal portion of the fin is contained about four times in the length of the body.

Radial formula: D. 100; A. about 85; C. 6 or 7; V. $\frac{1}{1}$; P. 19+7 or 8. L. lat. 110–120.

The *Talisman* obtained it off the coast of Soudan, from stations LXXX, LXXIX, and LXXIX, *bis*, at depths of 1,139, 1,232, and 1,250 meters, respectively, and on the Banc d'Arguin, from stations LXXXVIII, LXXXVII, and XCIII, at depths of 888, 1,113, and 1,495 meters, 28 specimens having been taken from the last-named locality.

The *Blake* secured specimens from station CCCXXVI, in 33° 42′ 15″ N. lat., 76° 00′ 50″ W. lon., at a depth of 464 fathoms; from station CCCXXV, in 33° 35′ 20″ N. lat., 76° W. lon., at a depth of 647 fathoms; from station CLXVI, off Guadeloupe, at a depth of 734 fathoms; and from station XCI, off Dominica, at a depth of 982 fathoms. And the *Albatross* from station 2115, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., at a depth of 843 fathoms; from station 2485, in 28° 51′ N. lat., 88° 18′ W. lon., at a depth of 730 fathoms; from station 2553, in 39° 48′ N. lat., 70° 30′ W. lon., at a depth of 551 fathoms; from station 2140, in 17° 36′ 10″ N. lat., 76° 46′ 05″ W. lon., at a depth of 966 fathoms; from station 2392, in 28° 47′ 30″ N. lat., 87° 27′ W. lon., at a depth of 724 fathoms; from station 2393, in 28° 43′ N. lat., 87° 14′ 30″ W. lon., at a depth of 525 fathoms; Cat. No. 33447, U. S. N. M., from station 2072, in 41° 53′ N. lat., 62° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 35586, U. S. N. M., from station 2216, in 39° 47′ N. lat., 70° 30′ 30″ W. lon., at a depth of 963 fathoms; Cat. No. 34906, U. S. N. M., from station 2117, in 15° 24′ 40″ N. lat., 63° 31′ 20″ W. lon., at a depth of 983 fathoms; Cat. No. 35657, U. S. N. M., from station 2234, in 39° 09′ N. lat., 72° 03′ 15″ W. lon., at a depth of 810 fathoms; Cat. No. 35553, U. S. N. M., from station 2216, in 39° 47′ N. lat., 70° 30′ 30″ W. lon., at a depth of 963 fathoms; and Cat. No. 35555, U. S. N. M., from station 2204, in 39° 30′ 30″ N. lat., 71° 44′ 30″ W. lon., at a depth of 728 fathoms.

MIXONUS, Günther.

Mixonus, GÜNTHER, Challenger Report, XXII, 1887, 108.

The lower pectoral rays are free, not united by membrane with, but inserted on the same base as the upper part of the fin. They are but slightly stronger than the other rays and prolonged. Body elongate, compressed, covered with small, very thin and deciduous scales. Head slightly compressed, broad and flat above, depressed in front, naked (with the exception of the parts between the mandibles, and perhaps the cheeks). Bones thin, with the muciferous system moderately developed, only one small spine above on the operculum; preoperculum without spine. Eye small. Vertical fins united, but the narrow caudal projecting beyond the short dorsal and anal rays. Ventrals each reduced to a filament, which consists of 2 rays firmly bound together in their whole length; they are inserted behind the humeral symphysis and close together. Snout broad, rounded, scarcely overlapping the lower jaw. Mouth very wide; villiform teeth in the jaws, on the vomer and palatine bones. Gill-laminæ short; gill-rakers long, not very closely set. Pseudobranchiæ none.

"I have long hesitated," writes Günther, "to describe this fish under a distinct generic name. The specimen is small, unique, and not in the best state of preservation, so that several of the characters assigned here to the genus may have to be amended when other specimens are obtained. Its pertinence to either *Pteroidonus* or *Dicrolene* seems to be doubtful on account of the difference in the shape of the head."

MIXONUS LATICEPS, GÜNTHER. (Figure 296, A.)

Bathynectes laticeps, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 5th ser., 20.
Mixonus laticeps, GÜNTHER, Challenger Report, XXII, 1888, 108, pl. XXV, fig. 8.
Sirembo Güntheri, VAILLANT, Exp. Sci. Travailleur et Talisman, 1889, 268, pl. XXIV, fig. 5.

Head slightly, body and tail more strongly compressed, low; the latter produced into a moderately long filament. Eye rather small, its diameter being one-seventh of the length of the head, two-thirds of that of the snout, and two-fifths of the interorbital space, which is convex. The posterior nostrils are wide; the muciferous channel of the infraorbital ring shows in its course 5 or 6 wide sinuses, and opens in front by a wide aperture. Mouth very wide, extending far behind the eye, with the extremity of the maxillary much behind the eye, and much dilated. Vomerine band of teeth V-shaped, with the two arms of the figure straight; palatine band narrow.

The *Challenger* obtained it in the mid-Atlantic (station 104), at a depth of 2,500 fathoms. The *Talisman* also secured examples from station CI, off the Cape Verde Islands, at a depth of 3,200 meters.

SIREMBO, Bleeker.

Sirembo, BLEEKER, Act. Soc. Sc. Neerlandaises, III; Japan, IV, 22.—GÜNTHER, Cat. Fish Brit. Mus., IV, 373.—GILL, Proc. Acad. Nat. Sci., Philadelphia, 1863, 253.
Sirembo, VAILLANT, Exp. Sci. Trav. et Talisman, 267 (in widely different sense).
Brotella, KAUP, Wiegmann's Archiv., 1858, 92.

Brotulids, with elongate body covered with small scales. Lateral line continuous, but more or less indistinct. Eye moderate. Vertical fins united. Ventrals close together; each a single simple filament, inserted on the foremost part of the humeral symphysis. Teeth in villiform bands on jaw bones and palatines. Upper jaw longer. Preoperculum unarmed. No barbel. Branchiostegals 8. Pseudobranchiæ and air-bladder present. Pyloric cæca 12.

The genus, as limited by Gill, includes one species, *S. inermis* (Schlegel) Bleeker, from Japan and not certainly known to be bathybial.

The genus *Hoplobrotula* Gill (Proc. Acad. Nat. Sci., 1863, 253) was established for another Japanese form (*Brotula armata*, Schlegel), cited by Günther in his catalogue under *Sirembo*. It is not certainly known to be bathybial.

Vaillant enlarges the limits of *Sirembo* to include the forms here discussed under *Sirembo*, *Hoplobrotula*, *Catætyx*, *Mixonus*, *Bathyonus*, *Porogadus*, *Nematonus*, *Diplacanthopoma*, and *Neobythites*. Vaillant's *Sirembo* is a congeries of heterogeneous forms, including, probably, representatives of three subfamilies.

MONOMITOPUS, Alcock.

Monomitopus, ALCOCK, Ann. and Mag. Nat. Hist., 1890, II, 297.

This genus differs from *Sirembo* in the character of its pseudobranchiæ, which are rudimentary—"really consisting of 2 small pinnules only on each side." It is represented by a single species, obtained by the *Investigator* in the Andaman Sea, in 490 fathoms. (*Sirembo nigripinnis*, Alcock, *op. cit.*, 1889 (Nov.), 384.)

TYPHLONUS, Günther.

Typhlonus, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, 217; Challenger Report, XXII, 118.

Head large, compressed, with most of the bones in a cartilaginous condition; the superficial bones with large muciferous cavities not armed. Snout a thick protuberance projecting beyond the mouth, which is rather small, inferior. Trunk very short, the vent being below the pectoral; tail thin, strongly compressed, tapering, without separate caudal. Eye externally not visible, reduced to a minute rudiment hidden below the skin. Bands of villiform teeth in the jaws, on the vomer and palatine bones. Barbel, none. Ventrals reduced to simple filaments, placed close together on the humeral symphysis. Gill openings very wide, the gill membranes being but slightly united in front. Gills 4; gill laminæ rather short; gill rakers of moderate length; scales thin, deciduous, small.

The only representative of this genus is *Typhlonus nasus*, Günther, (Challenger Report, XXII, 119, Pl. XXV, A.) obtained by the *Challenger* at station 181, northeast of Australia, in 2,440 fathoms, and at station 198, north of Celebes, at the depth of 2,150 fathoms.

BARATHRONUS, Goode and Bean.

Barathronus, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, 164.

Brotulids having the head stout, body and tail compressed, covered closely by skin, scaleless. Vent far behind pectoral, included in a cleft. Mouth wide, oblique, the lower jaw projecting. Intermaxillary teeth rudimentary; several fang-like teeth on the head of the vomer, none on palatines. A few rather large, recurved, separated teeth in the mandible. Nostrils close together and small. Eye visible through the skin, partly upon the top of the head, with or without dark pigment in the iris. Barbel, none. Gill-rakers very numerous and slender, and rather long. Gill-laminæ well developed on all the arches. No pseudobranchiæ. Head full of muciferous channels. Gill membranes not united, but covered by a fold of skin. Ventrals reduced to single simple rays, placed in advance of the pectorals and close to the humeral symphysis. Dorsal and anal placed far back.

Caudal scarcely differentiated, composed of rather numerous very slender rays upon a somewhat narrow base.

BARATHRONUS BICOLOR, GOODE and BEAN. (Figure 298.)

Barathronus bicolor, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, No. 5, 164, 7.

Body much compressed, its greatest height (19 millimeters) contained 6¼ times in the total length. Head much thicker than body, its greatest width equal to ⅔ of its length (23 millimeters), which is contained 5¼ times in the total length. Eye concealed by the skin; diameter of orbit about equal to width of interorbital area, and contained 4¾ times in length of the head. Maxilla extends slightly beyond the perpendicular through posterior margin of orbit; it is almost entirely concealed under the preorbital, and is much expanded at the tip, where its width is rather greater than that of the eye. Intermaxilla very thin, broad, and slightly protractile.

Vomer very close to intermaxillary symphysis, its head somewhat raised and bearing 3 fang-like teeth (2 of which are off one side and 1 on the other in the type, separated by a moderately wide interspace). The mandible has five enlarged, separate, recurved teeth upon each side, which increase in size posteriorly; its upper edge, posteriorly, is produced above the level of the tooth-bearing surface, and is received under the expanded maxilla. The longest gill-raker is about as long as the eye. The dorsal origin is distant from the snout (54 millimeters), which is contained slightly less than twice in the total length. The rays are well developed, numerous, long and slender, about 70 in number; the longest contained about 3 times in the length of head.

The anal originates in vertical from fourteenth dorsal ray, equidistant from eye and base of caudal. It contains 57 rays, about as long as those in the dorsal.

The pectoral with a fleshy base, its length (18 millimeters) a little less than height of body.

The ventral well in advance of pectoral, close to humeral symphysis, the rays being placed very close together at their origin, the length of the fin (13 millimeters) contained about 9 times in the total length, about 3 times in distance from its origin to the vent.

The caudal has about 10 rays; its length is contained about 8 times in the total length.

Color, yellowish white, with a broad vertical band of black from the origin of ventral nearly to the vent; another similar and narrower band above it upon each side.

The type is an individual, 120 millimeters long, from Blake station LXXI, off Guadaloupe, at a depth of 769 fathoms.

APHYONUS, Günther.

Aphyonus, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 22; Challenger Report, XXII, 1887, 120.

Head, body, and tapering tail strongly compressed, enveloped in a thin, scaleless, loose skin. Vent far behind the pectoral in nearly the middle of the total length. Snout swollen, projecting beyond the mouth, which is wide. No teeth in the upper jaw; small conical teeth in the lower, pluriserial in front and uniserial on the side. Vomer with a few rudimentary teeth; palatine teeth none. Nostrils close together, small. No externally visible eye. Barbel none. Ventrals reduced to simple filaments, placed close together and near to the humeral symphysis. Gill-membranes not united. Four branchial arches, the posterior without gill-laminæ; the anterior with very short gill-rakers and with rather short gill-laminæ. Head covered with a system of wide muciferous channels and sinuses, the dermal bones being almost membranaceous, whilst the others are in a semicartilaginous condition. Notochord persistent, but with a superficial indication of the vertebral segments (as in some Leptocephaline forms). (*Günther.*)

This genus is known from two species—*A. mollis*, Goode and Bean, and the type, *A. gelatinosus*, Günther (Challenger Report, XXII, 1887, 120, pl. XXVI, Fig. A) from station 184, between northeast Australia and New Guinea, at a depth of 1,400 fathoms.

APHYONUS MOLLIS, Goode and Bean. (Figure 299.)

Aphyonus mollis, Goode and Bean, Bull. Mus. Comp. Zoöl., XII, 163.

The body is much compressed, its greatest height (14 millimeters), 6 in its total length. Head thicker than body, its height (15 millimeters) slightly greater. Length of head 20 millimeters) about 4¼ in total; width (11 millimeters) over half its length. Snout, 3⅓ in length of head. Eye not externally visible. Diameter of orbit, as seen through the skin, about one-fourth length of head. Maxilla extends to vertical through posterior margin of orbit, the mandible somewhat farther back, its length (13 millimeters) nearly equal to height of body. A few weak teeth on vomer, palatines and mandible, and very rudimentary ones in maxillary; not visible to the eye, but appreciable to the touch. Gill-laminæ on the fourth and rudimentary gill-rakers, 8 rudiments and 4 developed below the angle. Dorsal origin almost over posterior edge of operculum, its distance from the snout ¼ of total length; fin-rays, more than 110 well developed, the longest 3 in head. Anal origin slightly nearer base of caudal than to tip of snout, its rays shorter than those in the dorsal. Pectoral with a fleshy base; its origin somewhat behind that of the dorsal, its length equal to width of head. Ventral origin in advance of that of pectoral, close to humeral symphysis; the fin is a single simple ray, whose length (11 millimeters) equals that of the pectoral; its tip does not reach the vent by a space equal to height of head.

Skin not loose. Texture of body rather firm, not transparent, whitish.

The type is a specimen obtained at *Blake* station CCXXI, lat. 24° 36′ N., lon. 84° 5′ W., at a depth of 955 fathoms.

This species is closely allied to *Aphyonus gelatinosus*, Gthr.

RHODICHTHYS, Collett.

Rhodichthys, Collett, Norske Nordhavs Exped., Fiske, 1880, 153.—Günther, Challenger Report, XXII, 1887, 121.

Head thick, body and tail strongly compressed, the latter tapering behind, enveloped in a thin, transparent, scaleless skin. Vent immediately behind the humeral symphysis. Snout swollen, overlapping the wide mouth. A few series of weak teeth in the jaws, none on the vomer or palate. Eye of moderate size. Ventrals reduced to two filaments, each bifid, and inserted on the hyoid. Vertical fins continuous, but with caudal rays differentiated. Gill-openings very wide. Pyloric appendages 10. (*Günther* after *Collett.*)

RHODICHTHYS REGINA, Collett. (Figure 303.)

Rhodichthys regina, Collett, Forh. Selsk., 1878, 99; Norske Nordhavs Exped., Fiske, 1880, 154.

The length of the head is to the total length nearly as 1 to 4, the extreme depth of the body as 1 to 4⅙. Anterior part of the body deep, in the posterior region rapidly tapering; tail at base long and slender. Upper jaw longer than lower. The dorsal fin originating immediately above the branchial aperture; the caudal projecting to the extent of three-fifths of its length beyond the dorsal and anal. Eyes small, their diameter being to the length of the head as 1 to 7; interorbital space wide. The teeth exceedingly minute, arranged in several series. Nostrils double. Pyloric appendages 10.

Radial formula: D. 60; A. 57; P. 11–12.

Color a uniform bright red. (*Collett.*)

A single specimen, 297 millimeters in length, was obtained by the North Atlantic Expedition in the open sea between Beeren Eiland, Jan Mayen, and Finmark.

ALEXETERION, Vaillant.

Alexeterion, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 282.

Brotulids having a scaleless body, head short; lower jaw curved up in front of the upper one so that the mouth opens vertically; very fine teeth on the jaws, vomer and palatines toothless. Eye rudimentary. No barbel. Gill-opening very wide. Branchiostegal membrane free. Vent very far from the throat and nearly in the middle of the length of the fish. Vertical fins beginning far back, the dorsal origin being over the vent and confluent at the tail. Pectorals broad, fan-shaped; ventrals absent.

ALEXETERION PARFAITI, VAILLANT. (Figure 300.)

Alexeterion Parfaiti, VAILLANT, Exp. Sci. Travailleur et Talisman, 283, pl. XXV, Figs. 2, 2*a*, 2*b*.

Body elongate, compressed (especially posteriorly), its greatest height being scarcely one-sixth of the thickness above the pectorals, and one-eighth of the total length.

Length of head one-sixth of total length; its globular form gives it a very singular appearance, suggestive of *Uranoscopus* and *Synanceia*. The head appears as if it were truncated in front; the snout occupies the upper portion of the truncation. The mouth is shaped like a horseshoe and is placed vertically, the lower jaw being entirely outside of the opening, while the two mandibles are strongly curved. The intermaxillary is narrow, nearly as long as the maxillary, which is expanded at its posterior extremity.

Teeth fine, uniform in size, upon the mandible and on the anterior portion of the intermaxillary. No teeth visible upon the vomer or palatines. The eye is rudimentary, very small, its diameter about one-fifth of the length of the head, so that it looks like a black pigmentary spot, and is scarcely visible in the fresh specimen. Branchial opening broad.

Vent near the middle of the body. No trace of scales in the lateral line visible.

Vertical fins confluent, the dorsal beginning in the vertical from the vent and nearly opposite the origin of the ventral, the rays being excessively delicate. Pectorals extending to the vertical from the origin of the dorsal. No ventrals.

Color, roseate white.

Measurements.

	Millimeters.	100ths.
Length	42	......
Height	7	16
Thickness	5	12
Length of head	7	16
Length of caudal fin	7	16
Length of snout	3	43
Diameter of eye	0.5	7
Width of interorbital space	4	57

A single specimen was taken at the French station CXXXVII, North Atlantic, at the depth of 5,005 meters.

BELLOTTIA, Giglioli.

Bellottia, GIGLIOLI, Zoologischer Anzeiger, VI, 399 (July, 1883.)

Brotulids with the form and proportions of *Pteridium*; body covered with smooth, adhesive scales of very small dimension. Eyes small. Vertical fins united, ventrals absent. Lower jaw with a band of small teeth, sharp and numerous, intermingled with a few conical ones, somewhat larger; upper jaw with a villiform band of very minute teeth; sharp teeth on the vomer and palate, disposed in a semicircular arch. Jaws equal anteriorly, the upper one expanded posteriorly as in *Pteridium*. No barbel. Branchial rays 4. Gills with 4 long branchial appendages; branchial aperture large. Air-bladder present.

BELLOTTIA APODA, GIGLIOLI.

Bellottia apoda, GIGLIOLI, Zoologischer Anzeiger, VI, 399.

The vent equidistant from the tip of the snout and root of the tail. Dorsal origin in the vertical from the middle of the pectorals, confluent with the caudal and the anal. Pectorals normal and small. Body covered with mucous pores particularly conspicuous upon the head. Anal papilla sometimes present. Lateral line simple, slightly arched over the pectorals, straight and median posteriorly. Two cutaneous folds parallel to the base of the dorsal. The central rays of the caudal are the longest.

Radial formula (estimated): D. 90; A. 75; C. 12.

Color, olive gray, with minute dots of black; fins black at the base, colorless and transparent elsewhere.

The two types measure 28 to 30 millimeters. Five specimens of this form were taken in the net in the Gulf of Naples in December, 1882, at the depth of 30 meters. Two of them (the types of this description) are in the Italian collection of the Royal Zoölogical Museum at Florence; two more in the Museo Civico at Milan; the fifth in the Zoölogical Station in Naples.

Although not yet found at considerable depths, its affinities, in the opinion of Giglioli and Vinciguerra, appear to be with the family *Brotulidæ*, and the genus is admitted to this work not only for the purpose of comparison, but in the belief that it will eventually be found in deep water.

HEPHTHOCARA, Alcock. (Figure 301.)

Hephthocara, Alcock, Ann. and Mag. Nat. Hist., 1892, 349. (Type, *H. simum*, *loc. cit.*, pl. XVIII, fig. 1.)

Head large, with thin, smooth, uncrested bones, scaleless. No armature but a weak opercular spine. Body compressed, tapering, covered with deciduous cycloid scales. Eye moderate. Snout not overhanging the jaws. Mouth with obliquely ascending cleft, and with the lower jaw prominent. Villiform teeth in the jaws, palatines, and vomer. No barbel or hyoid filaments. Gill-openings wide; gill membranes separate, 4 gills; no pseudobranchiæ; 8 branchiostegals. Lateral line indistinguishable. Vertical fins confluent; pectoral fins entire; no ventral fins.

The type, *H. simum*, was described from an immature specimen, 8 inches long, taken by the *Investigator* off the Coromandel coast, in 902 fathoms.

LAMPROGRAMMUS, Alcock. (Figure 302.)

Lamprogrammus, ALCOCK, Ann. and Mag. Nat. Hist., VIII, 1891, 32.

Head large, body compressed, both entirely covered with thin, smooth, deciduous scales of moderate size. Head bones with prominent crest and wide, muciferous cavities, unarmed except for a weak opercular spine. Snout not overhanging the jaws. Eye of moderate size. Mouth large; teeth in villiform bands in the jaws, palatines, and vomer. No barbel or hyoid filaments. Gill-opening wide; gill-membranes separate; 4 gills, 8 branchiostegals, no pseudobranchiæ. Lateral line very conspicuous, with much enlarged scales, each of which bears a glandular (luminous) organ. Vertical fins confluent; pectoral fins entire; no ventral fins. (*Alcock.*)

This genus is represented by the single species, *Lamprogrammus niger*, Alcock (*loc. cit.*, fig. 2), described from two specimens, 11⅝ and 15 inches in length, obtained by the *Investigator* in the Andaman Sea, at a depth of 561 fathoms, and another from 404 fathoms in the same region. Alcock says of it: "This extraordinary form seems almost entitled to rank by itself in a separate subfamily of the *Ophidiidæ*. In general appearance and in most of its structural details it has the closest resemblance to the typical *Brotulinæ*; but it differs from them all in its remarkable *Halosaurus*-like lateral line and in the entire absence of ventral fins."

Family OPHIDIIDÆ.

Gli Ofidini, RAFINESQUE, Indice d Ittiologia Siciliana, 1810, 34.

Ophidiidæ, BONAPARTE, Saggio, etc., 1832, 38; Cat. Met., 41.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 370 (part).—GILL, Arr. Fam. Fish., 1872, 3 (No. 19); Proc. Acad. Nat. Sci. Phila., 1887, 177.

Ophidioninæ, SWAINSON, Nat. Hist. Fish., etc., 1839, II, 179.

Ophidini, MÜLLER, Berl. Abhandl., 1840.

Ophidioidei, BLEEKER, Tentamen, XXV (part).

Ophidioidea, with chin ventrals, represented by bifid, barbel-like filaments, and the anus in the anterior half of the length. (*Gill.*)

KEY TO THE GENERA OF OPHIDIIDÆ.

A. Outer teeth in jaws fixed.
  1. Operculum unarmed .... [OPHIDIUM]
  2. A sharp concealed spine on the operculum .... OTOPHIDIUM
B. Outer teeth in jaws movable. Top of head scaly .... LEPTOPHIDIUM

OTOPHIDIUM, Gill.

Genypterus, PHILLIPI, Wiegm. Archiv., 1857, 268.

Otophidium, GILL,, in Jordan, Cat. Fish, N. A., 1885, 126.

A genus with characters of *Ophidium*, and also provided with a short concealed spine on the opercle.

OTOPHIDIUM OMOSTIGMA, (JORDAN and GILBERT), JORDAN. (Figure 305.)

Genypterus omostigma, JORDAN and GILBERT, Proc. U. S. Nat. Mus., 1882, 301; Bull. XVI, U. S. Nat. Mus., 963.

Otophidium omostigma, JORDAN, Cat. Fish, N. A., 1885, 126.

Body comparatively short, highest at occiput; thence tapering rapidly to tip of tail; upper profile of head very convex; snout blunt; mouth horizontal, the lower jaw included; maxillary not quite reaching posterior border of orbit; teeth in jaws uniform, strongly incurved, in rather broad bands; a single series of small teeth in vomer; those on palatines minute; maxillary $1\frac{7}{8}$ in head; eye large, 3 in head, much larger than snout, equaling twice interorbital width; opercle terminating in a strong, compressed spine, the length of which is about two-thirds diameter of pupil; gill-rakers very small, 4 below on anterior arch. Longest ventral filament half length of head; the shorter three-quarters length of longer. Distance from origin of dorsal to tip of snout $3\frac{1}{3}$ in total length; distance from origin of anal to snout $2\frac{1}{5}$ in total length. Scales minute, imbedded. Pseudobranchiæ not evident. Air bladder short, thick, with a large posterior foramen. Head $4\frac{1}{3}$ in length; depth about 6.

Color light olive-green, silvery on belly, cheeks, and lower side of head; sides above with a few irregular, large, scattered, dark blotches; about 9 of these along base of dorsal fin; an intensely black, round blotch on scapular region, rather larger than pupil; dorsal with black blotches; anal largely black; upper half of eye black, lower half bright silvery.

A single specimen, $3\frac{1}{2}$ inches long (No. 29670, U. S. Nat. Mus.), taken from the stomach of a red snapper, at Pensacola.

LEPTOPHIDIUM, Gill.

Leptophidium, GILL, Proc. Phil. Acad. Nat. Sci., 1863, 210.

Body much elongated, moderately compressed, and with the back and abdominal regions arched, more compressed and slowly decreasing in height backward to an abruptly rounded point.

Anus toward the end of the first third of the length.

Scales regularly imbricated in quincunx, oval, with the nucleus in front of the center, and with striæ radiating backward.

Lateral line concurrent with and near the back for about half the length, obsolescent behind.

Head with imbricated scales extending to forehead; opercula and cheeks moderately compressed, oblong-ovate in profile, with the snout high, projecting forward and obtusely rounded, armed above with a short, nearly concealed spine, directed forward and somewhat downward. Cheeks somewhat inflated. Eyes large, subcircular, with comparatively small pupils. Nostrils double; the anterior aperture a short tube directed forward and next to the groove separating the preorbital from the nostril region; the posterior a longitudinal groove. Opercula unarmed.

Mouth broader, with the cleft little oblique and moderate; the supermaxillary bones are slender, terminate under the hinder part of the eye, and are almost wholly retractile under the suborbitals.

Teeth of the jaws villiform, immersed in a mucous membrane, separated by an interval from the longer ones in the outer row, which are pointed and movable.

Vomer not prominent, armed, as well as the palatine bones, with teeth.

Branchial aperture ample, arched above by the membrane, which is attached in front of the axil of the pectoral fin.

Branchiostegal rays seven, the internal two small.

Dorsal fin commencing less than a head's distance from the nape, rather low and with its rays simply articulated, blending behind, like the anal, with the caudal fin, whose rays are longer than those of the dorsal and anal, and whose margin is produced.

Pectoral fins small or moderate, obliquely rounded behind.

Ventral fins bifid and articulated, and much abbreviated.

This genus is exceedingly distinct from *Ophidium*, having very few characters in common, except such as would be found in the genera of the same subfamily. Its form at once distinguishes it, its comparatively low and moderately compressed body and smaller head contrasting strongly with the much compressed body and head of the true *Ophidiidæ*. The imbricated scales and peculiar dentition observed on closer examination corroborate the generic distinction indicated by difference of form.[1]

KEY TO THE SPECIES OF LEPTOPHIDIUM.

A. Body elongate.
  1. Snout very short, sharp, armed with a spine.
    a. Color brown, with white spots .... L. CERVINUM
  2. Snout shorter than eye.
    a. Color light rufous, the vertical fins margined with black .... L. PROFUNDORUM
B. Body stoutish, anteriorly tapering.
  1. Snout blunt, spineless.
    a. Color yellowish, marbled with brown .... L. MARMORATUM

LEPTOPHIDIUM CERVINUM, GOODE and BEAN. (Figure 306.)

Leptophidium cervinum, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 422.

Body elongate, slender, its greatest height (25 millimeters in specimen examined) 10½ in its total length.

Head slender, somewhat compressed, its length (40 millimeters) 6½ in total length. Interorbital area broad, convex, its width equal to the length of the snout and 5⅔ in head's length. Snout sharp, conical, armed with a short but sharp spine, and somewhat overhanging the mouth. Eye circular, its diameter (10 millimeters) 4 in head's length, and much exceeding the length of the snout. Maxilla extending nearly to the vertical through the posterior margin of the orbit, its length (15 millimeters) three-eighths of head's length. Mandible extending behind the same vertical, its length (18 millimeters) equal to that of head without its postorbital portion. Jaws, vomer, and palatines with narrow bands of villiform teeth, some of which are noticeably enlarged (***not movable***). Pseudobranchiæ present.

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[1] It is probable that the *Ophidium brevibarbe*, briefly indicated by Cuvier and Kaup, belongs to this genus; by Cuvier it was simply alluded to in a foot-note of the Règne Animal, while by Kaup a short diagnosis was given in the "Catalogue of the Apodal Fish." As the notice of the species by Kaup, like most of the diagnoses by that gentleman, is only sufficient to distinguish it from species known to him, no clear idea can be obtained regarding its affinities. *Gill.*

Gill rakers short, 8 below angle of first arch, 4 of which are rudimentary, the longest (2 millimeters) 5 in diameter of eye. (In *L. profundorum* the gill-rakers are slenderer and longer, though about equally numerous on the first arch.)

Scales in about 11 rows from the origin of the dorsal to the median line of the body.

Ventrals with length (13 millimeters) 3 in that of head.

Dorsal origin far back, at a distance from the snout (55 millimeters) 4¾ in total length; at a distance from the eye equal to head's length. (In *L. profundorum* this distance is two-thirds of the head's length and the first ray of the dorsal is nearly over the middle of the extended pectoral; in *L. cervinum*, over its tip, or nearly so.)

Anal origin with distance from snout (84 millimeters) 3 in total length. Length of pectoral (19 millimeters) 2 in head's length and 13 to 14 in that of body (10 in *L. marmoratum*, 11 in *L. profundorum*).

Scales ornamented with radiating striæ, covering densely all parts of the fish except the snout and under surface of the head and the fins. Lateral line continued almost to the end of the tail.

Color brownish-yellow, with numerous subcircular spots of white, with diameter half that of eye along the upper half of the body. Vertical fins with narrow black margin.

The type (Cat. No. 28704, U. S. N. M.) 262 millimeters in length, was taken by the *Fish Hawk* from station 941, in 40° 01′ N. lat., 69° 56′ W. lon., at a depth of 76 fathoms. A single specimen (Cat. No. 28955, U. S. N. M.) was obtained by the same vessel from station 1036, in 39° 58′ N. lat., 69° 30′ W. lon., at a depth of 94 fathoms. The *Albatross* also secured examples (Cat. No. 37236, U. S. N. M.) from station 2309, in 35° 43′ 30″ N. lat., 74° 52′ W. lon., at a depth of 56 fathoms; (Cat. No. 32653, U. S. N. M.) from station 2004, in 37° 19′ 45″ N. lat., 74° 26′ 06″ W. lon., at a depth of 102 fathoms; and (Cat. No. 37235, U. S. N. M.) from station 2298, in 35° 39′ N. lat., 74° 52′ W. lon., at a depth of 80 fathoms.

LEPTOPHIDIUM PROFUNDORUM, GILL. (Figure 307.)

Leptophidium profundorum, GILL, Proc. Acad. Nat. Sci., Phila., 1863, 211.—JORDAN, Cat. Fish. N. America, 1885, 126.

Ophidium profundorum, JORDAN and GILBERT, Bull., XVI, U. S. Nat. Mus., 793.

The greatest height equals about a tenth of the extreme length, and is developed at the pectoral region; it thence almost uniformly decreases to the end, and at the anus equals one-eleventh of the same; the thickness behind the pectoral fins equals seven-tenths of the height, and almost uniformly decreases to the end like the height. The anus is at the end of the first third of the length.

The head forms rather less than a sixth of the length, and is transversely convex above and moderately inflated on the sides; the greatest width equals half its length. The eye is rather longer than the snout, subcircular, and its diameter slightly exceeds two-sevenths of the head's length; its pupil is small, the diameter equaling only a third of that of the eye. The width of the interocular region rather exceeds two-ninths of the head's length. The supramaxillary ends behind under the hinder margin of the pupil.

The dorsal fin commences nearly over the middle of the pectoral fin, and with the second fifth of the length and is moderately high; the anal commences immediately behind the anus, and is about as high as the dorsal; the caudal rays of the fin are the longest. The pectoral fin little exceeds half the head's length, and the longest branch of the ventral is less than a third of the head's length, and three-fifths greater than the shorter.

The color is a light rufous; the vertical fins margined with black.

The following notes show the relative proportions:

Extreme length (7 inches), 100; length to end of middle caudal rays.

Body.—Greatest height, 10; greatest width, 7; height at anus, 9; width at anus, 7; height between anus and caudal, 6½.

Head.—Greatest length, 16; distance from snout to nape, 11; greatest width, 8; width of interocular area, 3½; height of preorbital, 1⅓; length of snout, 4; length of supramaxillary, 6.

Eye.—Diameter, 4½; diameter of pupil, 1½.

Dorsal (spinous).—Distance from snout, 21; height over anus, 4; height near caudal, 5.

Anal.—Distance from snout, 33; height at middle, 4½; height near caudal, 4.

Caudal.—Length of middle rays, 5½.

Pectoral.—Length, 8½.

Ventral.—Length of longer branch, 5; length of inner branch, 3.

A single specimen of this species, 7 inches in length, was obtained by Commodore Rodgers, at the depth of 30 fathoms, off the coast of Florida.

LEPTOPHIDIUM MARMORATUM, GOODE and BEAN. (Figure 308.)

Leptophidium marmoratum, GOODE and BEAN, Proc. U. S. Nat. Mus., VII, 1885, 423.

Body somewhat elongate, stoutish anteriorly, gradually tapering, its greatest height (27 millimeters) 7⅓ in total length.

Head thickish, its length (39 millimeters) 5 in total length. Interorbital area broad, convex, its width nearly equal to length of snout, which is very slightly less than 5 in head's length. Snout blunt, spineless. Eye circular, the diameter (10 millimeters) 4 in head's length and somewhat exceeding the length of the snout. Maxilla extends to the vertical through the posterior margin of the orbit, the mandible far beyond, its length equal to that of postorbital portion of head. Teeth on vomer and in the jaws in villiform bands, the outer series in the latter slightly enlarged. Pseudobranchiæ present. Gill-rakers short, 8 below angle of first arch, the longest less than one-half diameter of eye. Branchiostegals 7. Ventrals with length (22 millimeters) as long as postorbital part of head.

Dorsal origin at distance from snout (44 millimeters) contained 4½ in total length, with 28 rays in a space equal to length of head, counting from the origin of the fin.

Anal origin separated from snout by distance (76 millimeters) 2⅗ in total length.

Length of pectoral (19 millimeters) 2 in head's length, or 10 in total.

Scales closely imbricated, ornamented with delicate concentric striæ. Lateral line apparently complete, located about one-fourth distance from dorsal to ventral outline.

Color, yellowish gray, marbled along the entire upper half of head and body with olive brown. Dorsal and anal fins with black margins.

The type (Cat. No. 37237, U. S. N. M.), an individual 198 millimeters in length, was taken by the *Albatross* from station 2350, in 23° 10′ 30″ N. lat., 82° 20′ 21″ W. lon., at a depth of 213 fathoms.

Family ATELEOPODIDÆ.

Ateleopodoidei, BLEEKER, Tentamen, 1859, 139.

Ateleopodidæ, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 398.—GILL, Arr. Fam. Fish., 1872, 3 (No. 27); Century Dictionary, 361.

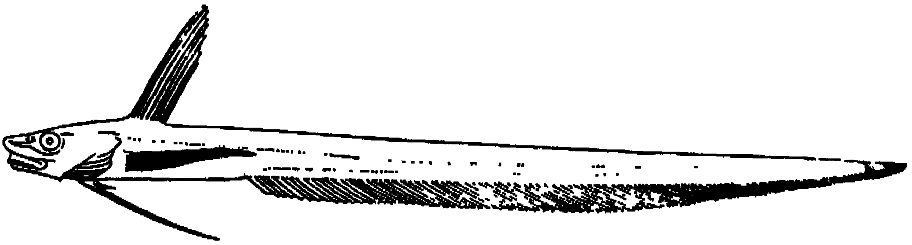
Ophidioids with elongate compressed, tapering tail, vent antemedian, suborbitals moderate, mouth inferior. One short anterior dorsal and no other; anal fin very long, confluent with caudal. Ventrals reduced to simple filaments, each of 2 rays, the inner of which is rudimentary, inserted behind the symphysis of the clavicle.

ATELEOPUS, Schlegel.

Ateleopus, SCHLEGEL, Fauna Japonica, Poissons, 255.—GUNTHER, *loc. cit.*; Challenger Report, XXII, 159.

Head with the snout much protruding and obtusely rounded, the cleft of the mouth being at the lower side of the head; maxillaries protractile in a downward direction. Body and tail compressed, elongate, naked. One short dorsal, the rudimentary second dorsal of the *Macruridæ* having entirely disappeared; one long anal, continued on to the caudal. Ventral reduced to a filament which is composed internally of two rays, intimately connected by a common membrane; this fin is inserted at the symphysis of the humeri. Teeth in the jaws villiform, in bands; vomer and palatine bones smooth. (*Günther.*)

The typical species, *Ateleopus japonicus*, Schlegel, is known from two specimens. One 9 inches long, taken at Oomura, in Japan, and another sent to the British Museum by the Tokio Museum. The Japanese call this fish *Sjatsfuri*, and consider it extremely rare. They believe it to be venomous, and to have electric powers. *A indicus*, Alcock, Ann. & Mag. Nat. Hist., 1891, 123, was obtained by the *Investigator* in the Indian Ocean, in 188 to 220 fathoms.



ATELEOPUS JAPONICUS.

Family LOPHOTIDÆ.

Lophoteoidei, **Bleeker**, Syst. Nat. Pisc. Tentamen, 1859, xxvi.
Lophotidæ, **Günther**, Cat. Fish. Brit. Mus., III, 1861, 312; Challenger Report, XXII, 76.

Body elongate, compressed, blade-like, without scales, and with vent near the tip of the tail. Head elevated in a high triangular crest upon which is a very long and strong spine, followed by a series of flexible rays, supporting the dorsal fin, which extends the entire length of the back to the base of the caudal. Anal very short and very far back. Ventrals thoracic. Caudal minute. Snout short. Feeble teeth, in jaws, on vomer, and palatines. Gill openings wide. Branchiostegals 6. Pseudobranchiæ present.

Günther is of the opinion that the "Lophotus" are deep-sea fishes like the Ribbon fishes, but that they do not descend to the greatest depths, their bony and soft parts being firm and coherent.

LOPHOTES, Giorna.

Lophotes, **Giorna**, Mem. Accad. Torino, IX, 1803. 17.—**Cuvier** and **Valenciennes**, Hist. Nat. Poiss., x, 405.—**Günther**, Cat. Fish. Brit. Mus., III, 312.

Lophotids with the head elevated in a high crest, surmounted with a long spine, which is followed by a very elongate dorsal fin. Vent near the extremity of the tail, with a small anal fin behind it; pectorals moderate; ventrals thoracic, very small, with 4 or 5 rays; caudal very small. Mouth not protractile, subvertical; with teeth pointed and feeble in the jaws, on vomer and palatines. Eye very large. The abdominal cavity extends nearly the whole length of the body. Air bladder present. Gills 4. Pseudobranchiæ present.

LOPHOTES CEPEDIANUS, GIORNA. (*Figure* 389.)

Lophotes Cepedianus, **Giorna**, Mem. Poiss. Esp. Nav., etc. (Read Sept. 20, 1803).—Mem. Accad. Imp. Sci. Torino, XVI (1809), 19, pl. II, fig. 1.—**Cuvier** and **Valenciennes**, Hist. Nat. Poiss, x, 405, pl. CCCI.—**Bonaparte**, Catalogo Metodico,716.—**Günther**, Cat. Fish. Brit. Mus., III, 312; Challenger Report, XXII, 76.—**Canestrini**, Fauna Italica, Pesci. 195.—**Giglioli**, Elenco, 32.—**Moreau**, Hist., Nat. Poiss., France, II, 250.
La Lophote Lacépède, **Cuvier**, Ann. Musée, XX, 1813, 393, pl. XVII; Règne Animal,ed. 1, 1817, II, 2433.
Lophotus Lacépède, **Risso**, Hist. Nat. Europe Méridionale, 1829, 293.

A *Lophotes* with the height of the body contained 7 times in its total length; its thickness 21 times. The skin, which is naked, is roughened by very minute furrows. The vent is very far back, near the extremity of the body. The head is very singular in its form, being elevated in front in a triangular crest, exceedingly sharp, and surmounted by a long, compressed spine, which corresponds to the first ray of the dorsal. Snout short; mouth small, not protractile, subvertical. Teeth cardiform upon the jaws, the vomer and palatines being also dentigerous. Eyes very large, their diameter about one-third of the length of the head. The opercular bones are somewhat striated. The lateral line extends from the crest to the caudal, describing a downward curve in front of the gill-opening. The dorsal begins upon the top of the head and in advance of the eyes, and terminates near the caudal, and contains more than 200 rays; the fins are very short and very far back. The caudal is very small. The pectorals are moderate, placed near the lower outline of the body. Ventrals minute.

Radial formula: D. 230; A. 17; C. 17; P. 15; V. I, 5.

Color silvery gray, with rounded spots of silver, which are brighter than the body itself; fins a brilliant rose color.

This species was first described by Prof. Giorna, who brought it before the Academy of Turin in 1803. His description was not complete, but Cuvier in 1813 received one from the Gulf of Genoa, and published a most exact description of it in the Annals of the Paris Academy of Sciences, accompanied by a drawing by Laurillard, of which a facsimile is here presented. The measurements of this specimen were as follows:

	Meters.
Total length	1.34
Height of body	.18
Length of head	.17
Height of body at branchial opening	.185
Height of body at base of nuchal spine	.205

Specimens have since been taken in various parts of the Mediterranean. The Florence Museum has a beautiful specimen, taken at or near Elba Island in 1848. Prof. Giglioli has also seen individuals from Nice, Genoa, and Palermo.

LOPHOTES CRISTATUS, JOHNSON.

Lophotes cristatus, JOHNSON, Proc. Zoöl. Soc., 1863, 38.

A *Lophotes* with elongate, compressed, blade-like body, its height contained 5¼ times in its length, its thickness over 30 times. The line of the unarmed belly is nearly straight. The back curves upwards slightly for the first third of the length of the fish and then slopes gently to the tail. The body clothed with small scales, which are buried in the skin and set obliquely so as to give a reticulate appearance. Scales large and very delicate.

Radial formula: D. ca. 255; A. 19; P. 13; C. 15; V. 5.

Color, uniform silvery gray, without spots.

This species was obtained by Mr. J. Y. Johnson in Madeira, and described by him in 1863. The characters pointed out by him seem to indicate that it is specifically distinguished from *L. Cepedianus*, but the material available for study has been so slight that no definite conclusion can now be reached. Since no figure of this species has been published, the complete description is here included:

The head is short and unarmed; it bears a high fleshy crest, the horizontal line of which is straight with the back. This crest carries the anterior portion of the dorsal fin, and it projects at an acute angle beyond the vertical of the snout. At the angle rises a single bony ray, which is equal in length to one-fourth of the total length of the fish. A fringe of red membrane connects it with the dorsal fin, of which it appears to be the first ray. The edges of the gill-covers are simple, the bones radiate-striate. The round eye is large, its diameter being contained 3 times in the head; the iris is silvery white, the pupil oval. The space intervening between it and the front of the head above the jaw is much less than a diameter; but the space between the edge of the capital crest and the superior part of the head is considerably more than a diameter. The space between the eye and the snout is reddish and scaleless. The mouth is oblique and rather small; the rictus about two-thirds the diameter of the eye, and its width almost equal to a diameter. There are about 4 rows of small, conical-pointed teeth, which curve backwards at the front of the premaxillary; and about 2 rows of similar teeth at the sides of the lower jaw, whilst in front they are crowded 4 or 5 deep. Small teeth, very few in number, are planted on the vomer and on the anterior extremities of the palatine bones; but there are none on the tongue. Inside the mouth, above and below, there is stretched a black membrane from side to side. The maxillary is toothless and is much dilated below. It covers the premaxillary at the sides, and reaches back to the vertical through the middle of the eye.

The single dorsal fin extends from the capital crest to the caudal fin, from which it is not easily distinguished. Behind the long, bony ray already mentioned it is low, the middle portion being higher than the rest. The base is sheathed in transparent membrane, an extension of the skin. The pectoral fins are of moderate size, placed low down, and at a distance from the tip of the lower jaw equal to about an eighth of the total length of the fish. The first ray is bony and very strong, but not longer than the rest, which are branched. The ventral fins are very short, and are inserted a little behind the pectoral fins, and only slightly below them. Only five slender, simple rays were counted in the specimen. The anal fin is low, it is placed far behind, near the caudal fin, and its first three or four rays are short. The vent is placed just before the fin. The tail behind the anal fin has parallel margins, and is much compressed. It is low, and its lower edge is finless, whilst its upper edge carries the posterior portion of the dorsal fin. The caudal fin is short, and is not well distinguished from the dorsal fin; but there seem to be fifteen rays, viz, 10 below the lateral line and 5 above. The lower angle only projects. This fin is not set on obliquely, as in some of the genera of the family.

The unarmed lateral line descends at an angle of 45° from the angle of the capital crest to behind the eye; it is then straight along the body to the base of the caudal fin.

The stomach is cæcal, narrow, and tapers downwards. Numerous cæca are attached to the intestine. The intestinal canal is long and straight; the egg-sac long and forked; the liver of moderate size.

TABLE OF MEASUREMENTS.

	Inches.
Total length	50
Height (14 inches from snout)	9½
Height of head through the eye	7⅜
Thickness for the greater part of body	1½
Head	6½
Eye:	
Diameter	2⅛
Distance from front of head	1½
Distance from edge of crest	$3\frac{8}{10}$
Mouth:	
Rictus	1½
Width	2
Teeth, length	$\frac{1}{10}$
Maxillary, width below	¾
Dorsal:	
Length of first ray	12¼
Height of middle portion	2

	Inches
Pectorals:	
Length	3⅛
Distance from tip of lower jaw	6¾
Distance from lower edge of body	1¼
Width of base	$\frac{8}{10}$
Ventrals:	
Length	½
Distance from root of pectorals	$\frac{7}{10}$
Anal:	
Height	$\frac{8}{10}$
Distance from caudal	1½
Tail, height	$\frac{7}{10}$
Caudal, length at lower angle	$1\frac{1}{10}$

LOPHOTES CAPELLEI, TEMMINCK and SCHLEGEL. (Figure 390.)

Lophotes Capellei, TEMMINCK and SCHLEGEL, Fauna Japonica, Poissons, 132, pl. LXXI.—(GÜNTHER, Cat. Fish. Brit. Mus., III, 312.)

A *Lophotes* having the length of the head equal to the height of the body, and contained about 7 times in total length. The eyes very large, their diameter contained 3½ times in the length of the head; the eye nearer to the throat than to the back. The angle of the head in front somewhat less acute than in *L. Cepedianus*. The length of the snout slightly less than the diameter of the eye. Mouth moderate, the tip of the maxillary reaching to the vertical from the anterior margin of the orbit. Teeth similar to those of the European species. Edge of preoperculum rounded, with a somewhat acute angle. The operculum rounded, its upper edge a little emarginate. Opercular bones finely striate. Body absolutely naked. The lateral line is straight, but in front of the eye ascends in a gentle curve to the tip of the crest and the base of the first dorsal ray. Vent at the beginning of the last eighth of the total length of the body; the anal fin, placed behind it, is rounded, and the length of its base twice as great as its height, the height being not more than half the vertical diameter of the orbit. The caudal is small, its length being one-third of the height of the body, it being considerably larger in proportion than in *L. Cepedianus*. Dorsal confluent with the caudal (not confluent in *L. Cepedianus*); its height in the middle is equal to one-fourth of the height of the body, but it decreases in height considerably posteriorly and anteriorly, so that over the eye the rays are scarcely perceptible above the skin. The seven anterior rays are longer, however, forming a sickle-shaped fin almost separate from the main dorsal fin in advance; the first ray is nearly 4 times as high as the second, its height nearly equal to that of the body; this ray is spinous, and thicker than the others, but smaller than in *L. Cepedianus*, and very sharp. The pectorals are placed very low down, close to the gill-opening. The ventrals, as in the European species, are very minute, and placed directly under the posterior edge of the pectoral.*

Radial formula: D. 9, 212; A. 3+18; C. 17; P. 16; V. 5.

Color, pale blue, becoming white on the lower parts and blackish blue upon the head; the fins are pale blood red; the iris of the eye is silvery white, shaded with bluish.

This species seems to be well distinguished from those of the Atlantic and Mediterranean, having a lower frontal crest; the first dorsal fin almost completely differentiated; the dorsal confluent with the anal; the mouth much less vertical, and with very different coloration. The species was obtained by Mr. Bürger in Japan, and by him a figure and certain notes appear to have been made. The figure has the appearance of being an exact one, and it would seem impossible to reconcile it with the Atlantic forms.

The fish must be exceedingly rare in Japanese waters. We have been unable to find any traces of it in the numerous drawings of Japanese fishes by native artists which we have examined.

Suborder ANACANTHINI.

Teleostean fishes characterized by spineless vertical and ventral fins, the latter jugular or thoracic when present, and the air bladder, if developed, with no pneumatic duct. The hypercoracoid imperforate. A foramen between the hypercoracoid and the hypocoracoid. (*Gill.*)

Family GADIDÆ.

I Gadini, RAFINESQUE, Indice d'Ittiologia Siciliana, 1810, 11.
Des Gades, CUVIER, Règne Animal, ed. I, 1817, II, 211.
Des Gadoïdes, CUVIER, Règne Animal, ed. II, 1829, II, 330.
Gadidæ, BONAPARTE, Saggio, 1832, 37.—SWAINSON, Nat. Hist. Fish., etc., 1837, II, 183.—BONAPARTE, Catologo Metodico, 1846, 42.—OWEN, Lect. Comp. Anat.—GÜNTHER, Cat. Fish, Brit. Mus. IV, 326.—COPE, 1870.—GILL, Arr. Fam. Fish, 1872, 3 (No. 27).
Gadoidei, MÜLLER, Berl. Abhandl, 1870.—BLEEKER, Tentamen, 1859, XXVI.

Anacanthine fishes, with elongate, posteriorly concoidal body; isocercal tail; scales cycloid and small, sometimes wanting. Head large, with terminal mouth. Gill-openings wide; gill membranes usually free from isthmus. Vertical fins well separated. Dorsal fin in one, two, or three sections, the latter—as well as the anal, which is also sometimes divided into two—sometimes united with the caudal. Ventrals subjugular. Gills 4, a slit behind the fourth. No pseudobranchiæ. Pyloric cæca usually numerous, but sometimes few in number or absent.

There is a general resemblance between this family and the *Brotulidæ*. Indeed Jordan and Gilbert make the Brotulids a subfamily of *Gadidæ*. We follow Gill for the present.

The Brotulids may be most readily distinguished by the ventrals which are always narrow and jugular, and usually filamentous [in those Gadoids, which have narrow, filamentous ventrals, there are always two dorsals] and by the almost universal confluence of the dorsal and anal with the caudal. [In the Gadoids which have the vertical fins confluent, there is always a separate first division of the dorsal.]

KEY TO THE DEEP-SEA GENERA OF GADIDÆ.

I. Three dorsals and two anal fins.
  A. Ventrals normal, with 5–7 rays .... *Gadinæ*
    1. Lower jaw shortest.
      a. Vomerine teeth present. Barbel well developed.
        Lateral line pale. Maxillary reaching past front line of eye. Mouth large. Hypocoracoid normal .... GADUS
        Lateral line black. Maxillary not reaching eye. Mouth small. Hypocoracoid swollen. MELANOGRAMMUS
      b. Vomerine teeth absent or exceedingly minute. No barbel .... GADICULUS

I. Three dorsals and two anal fins—Continued.
2. Lower jaw longest. Barbel absent or rudimentary.
a. Vent in vertical from space between first and second dorsal.
Teeth of upper jaw equal.................................POLLACHIUS
Outer row of teeth in upper jaw largest.................................BOREOGADUS
b. Vent in advance of vertical from origin of first dorsal.
First anal very long. Second dorsal small.................................MICROMESISTIUS
II. Dorsal fins two, anal one.
A. Ventrals narrow, filamentous, bi- or tri-radiate.................................*Phycinæ*
1. First dorsal with 8-10 rays.................................PHYCIS
2. First dorsal of 5 rays.................................LÆMONEMA
B. Ventrals broad, with 5-8 rays.
1. Anal fin entire. Mouth terminal.................................*Lotinæ*
a. Vomer with teeth; palatines toothless. A barbel.
All teeth villiform.
Head not compressed. Ventrals narrow.................................[LOTA.]
Head somewhat compressed. Ventrals broad.................................[SALILOTA]
Vomer and mandibles with enlarged teeth.................................MOLVA
b. Vomer and palatines toothless.
Teeth in jaws villiform, equal. Barbel.................................PHYSICULUS
An outer series of strong curved teeth in each jaw. No barbel.................................URALEPTUS
An outer series of strong teeth in lower jaw. Barbel.................................LOTELLA
2. Anal deeply notched or in two parts. Mouth inferior or subinferior.................................*Morinæ*
a. Anal in two parts.
Teeth cardiform, in band in upper jaw.................................MORA
b. Anal more or less deeply notched.
Teeth on vomer. Barbel.
Snout obtuse. Bones of head firm.................................LEPIDION
Snout produced. Bones of head cavernous, with large muciferous cavities..ANTIMORA
No teeth on vomer. No barbel. Anal in two connected divisions.
Snout obtusely conical. Mouth wide, nearly terminal.................................HALARGYREUS
C. Ventral rays 5 or more, elongate, exserted.
1. Ventral rays 5, very elongate, the three median ones with lanceolate tips.
a. A large abdominal cone.................................ERETMOPHORUS
2. Ventral rays 7, some of them slightly prolonged and with rounded heads.
b. No abdominal cone.................................HYPSIRHYNCHUS
III. Second dorsal and anal continuous with caudal. No barbel.................................*Melanoninæ*
A. No teeth on vomer and palatines.
1. Jaws with bands of small teeth, with an outer row of larger ones.................................STRINSIA
B. Teeth on vomer and palatines in narrow strips.
1. Jaws with teeth in villiform bands.
a. Tail long and tapering.................................MELANONUS
IV. First dorsal composed of a single ray and a band of fringes. Second dorsal and anal distinct.....*Oninæ*
A. Barbels three.
1. Snout without cirrus.................................ONOS
B. Barbels four.
1. Snout with cirrus.................................RHINONEMUS
V. Dorsal and anal fins single.
A. Ventrals well developed.................................*Brosmiinæ*
1. Teeth on vomer and palatines.
a. Teeth in upper jaw in narrow band. A barbel.................................BROSMIUS
2. No teeth on vomer and palatines.
a. Teeth in jaws biserial. No barbel.................................BROSMICULUS

GADUS, ARTEDI.

Gadus, ARTEDI, Genera Piscium, 1738, xix.—LINNÆUS, Syst. Nat., ed. x, 1758, 252.—BONAPARTE, Fauna Italica, fasc. 28, 1838.

Gadoid fishes with 3 dorsal and two anal fins, the anterior dorsal being but slightly elevated. Head large, oblong, conic, and pointed; the snout at least twice as long as the eye, the maxillary reaching past the front line of the eye. Mouth large. Barbel well developed. Ventrals normal. Lateral line pale.

Gadus morrhua, LINNÆUS, Systema Naturæ, ed. x, 1758, 252; ed. XII, 1766, 430—GÜNTHER, Cat. Fish. Brit. Mus. IV, 328.
Gadus callarias, LINNÆUS, *loc. cit.*—GÜNTHER, *loc. cit.*—JORDAN, Bull. XVI, U. S, Nat. Mus., 804.

A *Gadus* with large head, and maxillary which extends nearly to the middle of the orbit; with strong teeth in narrow, cardiform bands, the outer row of the upper jaw and the inner row of the lower jaw slightly enlarged. Snout more than twice as long as the eye; obtuse. Height of the body less than the length of the head, which is two-sevenths of the total (without caudal). Vent in vertical from anterior rays of second dorsal. The two anal fins separated. Barbel as long as, or longer than, the eye, the diameter of which is contained 7 times in the length of the head and twice or less in the interorbital space. Color, greenish, brownish, or reddish olive, with numerous spots on the back and sides; lateral line pale; fins dark.

Radial formula: D. 14–21–19; A. 20–18.

The species is subject to considerable modifications in form and color.

The time-honored name *Gadus morrhua* is retained. We can not assent to the substitution of the name *G. callarias*, which was based upon young specimens, and which, having been printed upon the same page, is in no real sense a prior name.

The cod occurs in great numbers below the 100-fathom limit on both sides of the North Atlantic, and has been reported by the New England fishermen on the off-shore banks at a depth of 250 fathoms. The *Albatross* obtained it from station 2082, in 41° 9′ 50″ N. lat., 66° 31′ 50″ W. lon., at a depth of 49 fathoms.

MELANOGRAMMUS, Gill.

Melanogrammus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 280; 1863, 237.

Gadoid fishes with 3 dorsal and 2 anal fins, the anterior dorsal elevated at an angle. Head large, oblong, conic, and pointed; the snout at least twice as long as the eye, the maxillary not reaching the eye. Mouth small. Barbel well developed. Ventrals normal. Lateral line black.

MELANOGRAMMUS ÆGLEFINUS, (LINNÆUS), GILL.

Gadus æglefinus, LINNÆUS, Systema Naturæ, ed. x, 1758, 251, XII, 1766, 435, 435.—GÜNTHER, Cat. Fish Brit. Mus., IV, 332.
Morrhua æglefinus, FLEMING. British Animals, 191.
Melanogrammus æglefinus, GILL, *loc. cit.*

A Gadoid with compressed conical head and a long and narrow, somewhat compressed, snout. Mouth small, maxillary scarcely reaching to the line from the anterior margin of orbit. Length of head equal to or greater than the height of body, and contained three and four-fifths times in the total length Teeth large, nearly equal in size, in a cardiform band in upper jaw, in a single series in lower jaw and on vomer. Eye very large, its diameter one-fourth the length of the head. Vent in vertical form orie in of second dorsal fin. First dorsal fin triangular, its anterior portion much elevated, its length three-fourths that of the head. The two anal fins separated by an interspace. Color, gray above, whitish below, lateral line black; a large dark blotch above the pectorals; vertical fins dark.

A specimen of this species was obtained by the *Albatross*, from station 2078, in 41° 11′ 30″ N. lat., 66° 12′ 20″ W. lon., at a depth of 499 fathoms—or, at all events, the specimen examined by us bears that inscription. It is almost incredible however. Another (Cat. No. 28743, U. S. N. M.) is said to have come from station 918 of the *Fish Hawk*, in 40° 20′ 24″ N. lat., 70° 41′ 30″ W. lon., at a depth of 46 fathoms.

GADICULUS, Guichenot.

Gadiculus, GUICHENOT, Explor. Algor. Poiss., 101.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 371.

Gadoids with body moderately elongate, covered with moderate scales. Cleft of the mouth oblique, with the lower jaw rather longer than the upper. Jaws with a narrow band of small teeth; vomerine teeth absent or very minute; no palatine teeth. Eye large.

Caudal separate; three dorsal and two anal fins; ventrals of seven rays. Branchiostegals, seven. No barbel.

This genus has the general appearance of *Gadus*, but is distinguished by the absence of teeth on the vomer.

GADICULUS ARGENTEUS, GUICHENOT.

Gadiculus argenteus, GUICHENOT, Exploration Scientifique de l'Algerie, Poissons, 1851, 102, pl. VI, fig. 2.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 341.
Gadus argenteus, GÜNTHER, Ann. and Mag. Nat. Hist., XIII, 1874, 138; Challenger Report, XXII, 1887, 83.
Merlangus argenteus, VAILLANT, Exp. Sci., Travailleur et Talisman, 1888, 302, pl. XXV, fig. 7; pl. XXVI, fig. 5 (tail).

A Gadoid, having a body similar in form to that of *Gadus;* its height one-fourth of its length, and its thickness one-seventh.

Length of head one-third of total length; snout short, its length less than one-fourth that of the head. Mouth moderate, oblique; the maxillary extending a little beyond the vertical from the anterior limb of the eye. The lower jaw is longest. Teeth in jaws in villiform bands; palatines and tongue without teeth. Vomer unarmed, except occasionally in individuals which have two or three minute asperities upon its angles. Diameter of the eye one-third that of the head; width of interorbital space one-seventh.

This species was taken by H. M. S. *Porcupine* off the west coast of Ireland (lat. 54° 10 N., lon. 10° 59′ W.), at the depth of 183 fathoms. It had previously been found in the Mediterranean, but the *Travailleur* obtained it again in 1882 in the Gulf of Gascony (station VIII) at 411 meters in great abundance, 50 specimens being brought in at one haul. The *Talisman* got it off Morocco at 540–550 meters (stations VIII and XVII) and off Soudan in 410 meters (station LXIX). It is yet to be found in the Western Atlantic.

MICROMESISTIUS, Gill.

Micromesistius, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 248.

Gadoid fishes with three dorsal and two anal fins, the dorsal fin separated by considerable interspaces. Second dorsal short, anal long. Head much as in *Gadus*, but with lower jaw longest and projecting beyond the upper. Teeth in outer series strongest. Vomerine teeth. No barbel. Vent in or near the vertical from the anterior margin of dorsal.

MICROMESISTIUS POUTASSOU, (RISSO), GILL.

Gadus merlangus, RISSO, Ichth. Nice, 115.
Merlangus poutassou, RISSO, Hist. Nat. Eur. Mérid., 1826, III, 287.—COLLETT, Norges Fiske, 1875, 111.—GÜNTHER, Challenger Report, XXII, 1887, 82.
Gadus poutassou, DÜBEN and KOREN, Vet. Akad. Handl., 1844, 88.
Gadus melanostomus, NILSSON, Skand. Fauna, IV, 1855, 556.
Micromesistius poutassou, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 248.

A Gadoid with body rather slender. Lower jaw longest and teeth in the outer strongest. The vent in vertical from origin of first dorsal. Dorsal fins separated by great interspaces, the two anterior short. Anal fins very long. No barbel. A black spot in axil of pectoral.

Radial formula: D. 12–13+13–14+24; A. 36–38+24–25.

This codfish occurs on the west coast of Norway up to the Polar Circle and beyond, and as deep as 100 fathoms. It is numerous in October and November in the Christiania Fiord (lat. 60°), according to Collett. It has been found as far north as Bodoe (67°). Strangely enough, it has not yet been distinguished on the New England coast. It is more than probable that it will yet be found among the captures of the cod schooners of the off-shore banks.

PHYCIS, Schneider.

Phycis, Schneider, Bloch's Systema Ichthyologiæ, 1801, 56 (type, *Phycis tinca*, Schn.).—Cuvier, Règne Animal, ed. 1, 1817, II, 216.—Günther, Cat. Fish. Brit. Mus., IV, 351.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 798.

Gadoids with rather elongate body, and with two dorsal fins, the first sometimes produced at the tip, and the second long, similar to the single anal. Head somewhat compressed; mouth rather large, the maxillary extending beyond vertical from front of orbit; lower jaw included; broad bands of subequal, pointed teeth on jaws and vomer, palatines toothless. Ventrals narrow, filamentous, each of 3 rays and widely separated. Gill membranes slightly connected, narrowly joined to the isthmus.

KEY TO THE SPECIES OF PHYCIS.

I. No filamentous ray in first dorsal.
  A. First dorsal triangular.
    1. Second dorsalnearly as high as first, 130 scales in lat. line .... P. MEDITERRANEUS
    2. Second dorsal much lower than first, 100 scales in lat. line .... P. BLENNIOIDES
  B. First dorsal falcate.
    1. Lateral line gently arched, with white spots. Pectorals passing ventrals. About 90 scales in lat. line .... P. REGIUS
    2. Lateral line strongly arched, broad over pectoral. Ventrals passing pectorals. About 155 scales in lat. line .... [P. EARLII]
  C. First dorsal rounded, not higher than second.
    1. Lateral line gently arched in front.
      a. Vent very far back. Ventrals attenuate, surpassing origin of anal. About 90 scales in lat. line .... P. CIRRATUS
II. A prolonged filamentous ray in first dorsal.
  A. Ventrals less than half as long as body.
    1. Lateral line gently arched. Ventrals surpassing pectorals.
      a. Scales moderate, about 110 in lat. line .... P. CHUSS
      b. Scales small, about 188 in lat. line .... P. TENUIS
  B. Ventrals more than half as long as body.
    1. Lateral line strongly bowed anteriorly. Ventrals very elongate.
      a. Scales large, about 90 in lat. line .... P. CHESTERI

PHYCIS MEDITERRANEUS, De La Roche.

Blennius phycis, Linnæus, Systema Naturæ, ed. XII, 1766, 442.—Brünnich, Ichthyologia Massiliensis, 28.—De la Roche, Ann. Mus., XIV, 1809, 280.—Risso, Ichth., Nice, 125.

Phycis mediterraneus, De la Roche, Ann. Mus., XIII, 1808, 332; Memoires, 46.—Risso, Hist. Nat. Eur. Mérid., 222.—Guichenot, Explor. Alger., 103.—Costa, Fauna Napol.—Lowe, Fishes of Madeira, 191, pl. XXVII.—Günther, Cat. Fish. Brit. Mus., IV, 354.—Canestrini, Archiv. Zool., II, 364; Fauna Italica, 157.—Giglioli, Elenco, 336.—Vaillant, Exp. Sci. Travailleur et Talisman, 1888, 289.—Moreau, Hist. Nat. Poiss., France, III, 266.

Phycis limbatus, Valenciennes, in Webb and Berthelot, Hist. Nat. Iles., Canar., 78, XIV, fig. 2.

A *Phycis* with its body 4 times the length of the head, which is slightly longer than its greatest height. Snout obtuse, projecting, longer than the diameter of the eye. Origin of first dorsal somewhat behind that of pectoral; its rays are not produced and it is scarcely higher than the second. Ventrals somewhat prolonged, but their tips not passing the origin of the anal. Scales small, about 130 in the lateral line, and 11 or 12 series above the lateral line below the first dorsal.

Radial formula: D. 9–11 + 57–63. A. 52–60.

Color brownish; dark upon the back, lighter upon the belly. Vertical fins with a black margin and a narrow, white edge.

This southern European Hake is known from the Canaries and Madeira; at moderate depths in the Mediterranean at Nice, Naples, and Sicily, and the coast of Algiers; and also in the Adriatic at Trieste and Venice; and is rare everywhere. It was taken by the *Travailleur* in 1882 in the Gulf of Gascony (station I) at a depth of 614 meters.

PHYCIS BLENNIOIDES, (Brünnich), Schneider.

Gadus blennioides, Brünnich, Ichthyologia Massiliensis, 1768, 24.
Phycis blennioides, Schneider, Bloch's Systema Ichthyologiæ, 1801, 56, pl. xi.—Risso, Hist. Nat. Eur. Mérid., 222.—Guichenot, Explor. Alger., 103.—Günther, Cat. Fish. Brit. Mus., iv, 1862, 352 (description); Challenger Report, xxii, 1887, '89.—Canestrini, Fauna Italica, 156; Gadidi, pls. xiii–xiv, fig 1.—Giglioli, Elenco, 36.—Moreau, Hist. Nat. Poiss., France, iii, 264.—Ström, Norsk. Vid. Selsk. Skrift, 1881, 76; 1887, 35.—Collett, Nyt. Mag. f. Naturvid., 1887.
Gadus albidus, Gmelin, Linn. Syst. Nat., 1788, i, 1171.
Phycis albidus, Vaillant, Exp. Sci. Travailleur et Talisman, 1888, 288, pl. xxvi, figs. 4 and 4ᵃ, 83.
Phycis tinca, Schneider, *loc. cit.*
Blennius gadoides, Lacépède, Hist. Nat. Poiss., vii, 334.—Risso, Ichth. Nice, 136.
Batrachoides Gmelini, Risso, Ichth. Nice, 143, pl. vi, fig. 6.
Phycis Gmelini, Risso, *op. cit.*, 223.
Phycis furcatus, Fleming, British Animals, 193, *et al.*

A *Phycis* with its body 4 times as long as its head, which is slightly longer than the greatest height of the body. Snout obtuse, slightly projecting, nearly as long as the diameter of the eye. Teeth in villiform bands on jaws and vomer. Origin of first dorsal directly above that of pectoral, its second and third rays prolonged in a filament shorter than the head. Ventrals filamentous, their tips passing the origin of the anal. Scales in lateral line about 100, and in 5 to 6 rows above lateral line under the first dorsal.

Radial formula: D. 9–11 + 57–62. A. 52–55.

Color, silvery-gray, the pectorals and ventrals with brown dots; the second dorsal, the anal, and the caudal edged with black; the first dorsal black in its anterior portion.

This, the "greater fork beard" of the English books, closely related to the hakes of New England, is identified by Vaillant with various fishes found off Portugal at depths of from 370 to 460 meters (stations xxv, xxvi, xxvii, lviii), and at Penon de Velez (station xxviii) at 370 meters. It has been recorded also from Nice, Naples, Corsica, and Sicily, but never from deep water in the Mediterranean. Günther admits it to the deep-sea fauna on the testimony of Ström and Collett, who report it from 70 to 200 fathoms off the west coast of Scandinavia.

PHYCIS REGIUS, (Walbaum), Jordan and Gilbert. (Figure 309.)

Blennius regius, Walbaum, Artedi, 1792, 186.
Urophycis regius, Gill., Proc. Acad. Nat. Sci. Phila., 1863, 240.
Phycis regius, Jordan and Gilbert, Proc. U. S. Nat. Mus., i, 1878, 371.—Goode and Bean, Proc. U. S. Nat. Mus., iii, 1880, pp. 70, 476; Bull. Mus. Comp. Zool., xi, 1883, 201; Cat. Fish. Essex Co. and Mass. Bay, 1879, 8.—Bean, Proc. U. S. Nat. Mus., iii, 1880, 70.—Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 798.
Enchelyopus regalis, Schneider, Bloch. Syst. Ichth., i (cloth), 1801, 33.
Phycis regalis, Kaup, Archiv. für Naturg. 1858, 89.—Gill., Cat. Fish. E. Coast N. A., 1861, 49.—Günther, Cat. Fish. Brit. Mus., iv, 1862, 354; Challenger Report, xxii, 1887, 89.
"*Gadus blennioides*, Mitchill., Medical Register, 1814."
Gadus punctatus, Mitchill, *ibid.*
Phycis punctatus, DeKay, Zool. N. Y., Fish., 1842, p. 292, Pl. xlvi, fig. 149.

A *Phycis* with its body 4½ times as long as the head, which is but very slightly shorter than the greatest height of the body. Snout obtuse and but slightly projecting, much longer than the diameter of the rather small, low-set eye. Origin of the first dorsal above or even slightly in advance of the vertical from that of pectoral; its rays are not prolonged and it is no higher than the second dorsal. Ventrals prolonged, their tip reaching to the vent, but not to the origin of the anal. Scales rather large, about 90 in the lateral line and about 5 above it under the first dorsal.

Radial formula: D. 8 + 43; A. 44–47.

Color, pale-brownish, tinged with yellowish, the lateral line dark brown, interrupted by white spots; inside of mouth white; first dorsal largely black, this color surrounded by white; second dorsal olivaceous, with irregular round dark spots; caudal, anal and pectorals dusky; ventrals and lower edge of pectorals white; two vertical series of round dark spots on the sides of the head.

The distribution of this species is very puzzling. It has been found at Halifax, Nova Scotia, and south as far the Cape Fear River, where specimens were taken in shallow water in March, 1880, by Col. Marshall McDonald. It has been found also in the York River, Virginia, a tributary of Chesapeake Bay, but is nowhere abundant except about Long Island. It has also been found at considerable depths, as is shown in the following list: By the *Blake* at station CCCXXXIII, in 35° 45′ 25″ N. lat., 74° 50′ 30″ W. lon., at depth of 65 fathoms; at station CCCXIV, in 32° 24′ N. lat., 78° 44′ W. lon., at a depth of 142 fathoms; and at station CCCXXI, in 32° 43′ 25″ N. lat., 77° 20′ 30″ W. lon., at a depth of 233 fathoms; by the *Albatross* at station 2418, in 33° 20′ N. lat., 77° 5′ W. lon., at a depth of 90 fathoms; at station 2417, in 33° 18′ 30″ N. lat., 77° 7′ W. lon., at a depth of 95 fathoms; at station 2309, in 35° 43′ 30″ N. lat., 74° 52′ W. lon., at a depth of 56 fathoms; at station 2312, in 32° 54′ N. lat., 77° 53′ 30″ W. lon., at a depth of 88 fathoms; at station 2264, in 37° 7′ 50″ N. lat., 74° 31′ 20″ W. lon., at a depth of 167 fathoms; at station 2421, in 37° 7′ N. lat., 74° 34′ 30″ W. lon., at a depth of 64 fathoms; at station 2265, in 37° 7′ 40″ N. lat., 74° 35′ 40″ W. lon., at a depth of 70 fathoms; at station 2311, in 32° 55′ N. lat., 77° 54′ W. lon., at a depth of 79 fathoms; and at station 2307, in 35° 42′ N. lat., 74° 34′ 30″ W. lon., at a depth of 43 fathoms.

Mr. A. Agassiz and the officers of the *Blake* had their attention forcibly attracted to a singular power possessed by this fish of emitting electric shocks. This peculiarity has never been noticed in this species save in deep water. The attention of observers is called to this interesting point.

PHYCIS CIRRATUS, GOODE and BEAN, n. s. (Figure 310.)

The body is moderately stout; its greatest height equals the length of the head without the snout and is contained 5 times in the length to base of caudal. The length of the head is one-fourth of the standard length. The eye is large, its length in the largest specimen examined slightly more, and in the smallest individual slightly less, than one-fourth that of the head. The width of the interorbital space is about one-half the length of the eye in large examples. The maxilla does not reach to the posterior margin of the orbit in large specimens, but in the smallest one it extends fully to that vertical. The mandible extends far beyond the posterior margin of the eye, and its length is about equal to the postorbital part of the head. The barbel is minute in all the examples examined; its length usually about one-fifth that of the eye. Teeth in villiform bands in both jaws, the intermaxillary bands being wider than those on the mandible. Vomerines in a narrow, villiform band. Gill-rakers 2+12. The largest ones club-shaped at the end; the longest one-fourth as long as the eye. Gill membranes attached to the isthmus, but with a narrow, free posterior border.

The length of the pectoral equals about one-half the distance from the ventral to the anal origin. It reaches to about the twenty-sixth row of scales. The ventral reaches in some specimens slightly beyond the origin of the anal. In one individual it reaches almost to the middle of the anal fin. None of the dorsal rays are filamentous, the longest rays being contained from 2½ to 3 times in the length of the head. The length of the base of the first dorsal is about equal to the length of the eye in most specimens; in smaller examples it is somewhat greater, about one-third the length of the head. The vent is under the sixteenth ray of the second dorsal.

Radial formula: D. 10+66; A. 57; Scales 6–93–20.

Color light brown; lower parts minutely dotted. Dorsals with narrow dark margins; caudal with a broad dark margin; anal with a narrow dark margin in its posterior third. Roof of mouth and interior of gill-cavity dark-brown.

The type of the present description is Cat. No. 39059 of the U. S. National Museum. It was taken by the steamer *Albatross* from station 2376, in 29° 03′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms. The additional specimens employed in the description are Cat. No. 39294, U. S. N. M., from station 2377, in 29° 7′ 30″ N. lat., 88° 9′ W. lon., at a depth of 210 fathoms; and Cat. No. 39295, U. S. N. M., from station 2397, in [illegible] N. lat., [illegible]° 36′ W. lon., at a depth of 280 fathoms. All the known examples are fro

PHYCIS CHUSS, (WALBAUM), GILL. (Figure 311.)

Blennius chuss, WALBAUM, Artedi, 1792, 186.

Phycis chuss, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 237.—GOODE and BEAN, Proc. U. S. Nat. Mus., x, 1883, 203.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 798.

Phycis americanus, STORER, Hist. Fish. Mass., 38.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 353; Challenger Report XXII, 1887, 89.

Enchelyopus americanus. SCHNEIDER, Bloch's, Syst. Ichth., 1801, 53.

A *Phycis* with the length of its body 4 times the length of its head, and 5 times its own height. Snout obtuse, slightly projecting. Origin of first dorsal in vertical above the root of pectoral, its first ray prolonged, its length about two-sevenths that of body. Ventrals filamentous, their tips quite beyond the origin of the anal. Scales in lateral line about 110, and with about 9 rows above the lateral line under the first dorsal.

Radial formula: D. 9+57; A. 50.

Many specimens apparently of this species were obtained outside of the hundred-fathom curve. The *Blake* secured examples from station CCCXI, in 39° 59′ 30″ N. lat., 70° 12′ W. lon., at a depth of 143 fathoms, and from station CCCXLVI, in 40° 25′ 35″ N. lat., 71° 10′ 30″ W. lon., at a depth of 44 fathoms. The *Albatross* obtained specimens from station 2420, in 37° 3′ 20″ N. lat., 74° 31′ 40″ W. lon., at a depth of 104 fathoms; from station 2539, in 39° 59′ 45″ N. lat., 70° 53′ W. lon., at a depth of 133 fathoms; from station 2537, in 39° 56′ 45″ N. lat., 70° 50′ 30″ W. lon., at a depth of 134 fathoms; and from station 2540, in 39° 58′ 20″ N. lat., 70° 52′ W. lon., at a depth of 144 fathoms.

This is a common species along the coast of the New England States from the shoals south of Cape Cod to the Gulf of St. Lawrence. It appears to be a bottom-living fish, rarely changing locality. It is believed that they spawn throughout the summer, for the young fish are found through all the summer months. Specimens taken at a depth of 37 fathoms in a temperature of 41°F. contained well-developed ova and were apparently ready to spawn. The young are frequently taken swimming on the surface on the southern coast of New England in the summer, and numerous individuals have been found off Block Island and Watch Hill, seeking shelter between the valves of a large species of scallop (*Pecten tenuicostatus*) at a depth of 20 to 40 fathoms. An extensive fishery is carried on in winter from Cape Ann, in which sometimes as many as fifty vessels are engaged. In 1878, at Gloucester alone 5,000,000 pounds at least of this and the related species, *P. tenuis*, were landed. Fishing is carried on at night with trawls in 10 to 50 fathoms. The species has been found off the coast of Virginia at a depth of 300 fathoms.

PHYCIS TENUIS, (MITCHILL), DE KAY. (Figure 312.)

Gadus tenuis, MITCHILL, Trans. Lit. and Phil. Soc. N. Y., 1814, 372.

Phycis tenuis, DE KAY, Zoöl. New York, Fishes, 1842, 293.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 232.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 1883, 203.—GÜNTHER, Challenger Report, XXII, 1887, 89.

Phycis De Kayi, KAUP, Archiv. für Naturgeschichte, I, 1858, 89.

Phycis furcatus, STORER, Boston Journ. Nat. Hist., I, 418.

A Phycis with its body about 5½ times as long as its own height, and 4¼ times as long as the head. Snout obtuse, slightly projecting, considerably longer than the diameter of the eye. Origin of first dorsal somewhat further behind that of pectoral than in *P. chuss*; its second ray somewhat prolonged, about two-thirds as long as the head. Ventrals somewhat prolonged, their tips not passing, and sometimes not reaching, the origin of the anal. Pectorals more slender than in *P. tenuis*, and scales smaller, there being about 140 in the lateral line, and about 12 rows between the origin of the first dorsal and the lateral line.

Specimens of this species were obtained by the *Blake* at station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; by the *Albatross*, from station 2513, in 43° 34′ N. lat., 63° 56′ 30″ W. lon., at a depth of 134 fathoms; and from station 2540, in 39° 58′ 20″ N. lat., 70° 52′ W. lon., at a depth of 144 fathoms; and a single specimen Donation, No. 422) by the Gloucester fishermen off the fishing banks.

PHYCIS CHESTERI, Goode and Bean. (Figure 313.)

Phycis Chesteri, Goode and Bean, Proc. U. S. Nat. Mus., I, 1878, 256; Cat. Fish. Essex Co. and Mass. Bay 1879, 8; Amer. Jour. Sci. and Arts, XVII, Jan., 1879, 40.—Goode, Proc. U. S. Nat. Mus., III, 337, 476.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 799.

Head contained in body (without caudal) 4⅓ times, height of body 5 times. Diameter of orbit in length of head 3⅓ times, maxillary twice. Barbel about one-third of diameter of orbit. Vent situated under 12th ray of second dorsal, and equidistant from tip of snout and end of second dorsal. Distance of dorsal fin from snout equal to twice the length of the mandible; the third ray of the first dorsal is extremely elongate, extending to a point (33d ray of second dorsal) two-thirds of the distance from snout to tip of caudal, its length more than twice that of the head, and more than four times as long as the rays immediately preceding and following it. Anal fin inserted immediately behind the vent, its distance from the root of the ventrals equal to that of the dorsal from the snout. As in the other species of the genus,[1] the ventral is composed of 3 rays, the first two much prolonged. The first is contained three times in the length of the body, the second is almost three times as long as the head, reaching to the 40th anal ray or ¾ of the distance from snout to tip of caudal; the third is shorter than the diameter of the orbit.

The pectoral is four times as long as the operculum. Scales large and thin, easily wrinkling with the folding of the thick, loose skin, particularly in the median line of the sides of the body. Lateral line much broken on the posterior half of the body.

Scales 7, 90–91, 28.

Radial formula: D. 9 or 10, 55 to 57; A. 56; C. 5, 18 to 21, 5; P. 17–18; V. 3.

TABLE OF MEASUREMENTS.

Current number of specimen	21,840.		21,841.		21,842.	
	Trawl 174.		Trawl 194.		Trawl 194.	
Locality	42 miles E. ½ S., Cape Ann, 140 fathoms, Aug. 27, 1878.		33 miles E. by S., Cape Ann, E. Pt., 110 fathoms, Aug. 31, 1878.			
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length (exclusive of caudal)	242	....	143	....	128	....
Length to end of middle caudal rays	280	....	166	....	148	....
Body:						
Greatest height	49	20	29	....	23	....
Greatest width	28	11½	....	....	....	....
Height at ventrals	39	16	23	....	20	....
Least height of tail	9	4	6	....	5	....
Head:						
Greatest length	56	23	33	....	30	....
Length of barbel	6	2½	4	....	....	....
Greatest width	29	11¾	16	....	14	....
Width of interorbital area	10	4⅛	7	....	6	....
Length of snout	15	6⅕	8	....	6	....
Length of operculum	13	5⅓	8	....	7	....
Length of maxillary	28	11½	17	....	14	....
Length of mandible	32	13	19	....	17	....
Distance from snout to center of orbit	24	10	14	....	12	....
Diameter of orbit	17	7	10	....	10	....
Dorsal (first):						
Distance from snout	67	27¾	38	....	34	....
Length of base	17	7	10	....	10	....
Length of first ray	15	6⅕	8	....	8	....
Length of second ray	28	11½	19	....	15	....
Length of third ray	117	48	50	....	42	....
Length of fourth ray	26	10¾	15	....	15	....
Length of last ray	3	1¼	15	....	4	....
Dorsal (second):						
Length of base	142	58	88	....	79	....
Length of first ray	15	6¼	....	....	....	....
Length of longest ray (40th)	29	11¾	17	....	15	
Length of last ray	5	2⅛	4	....	....	....

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[1] A critical study of the ventral fins of *Phycis* compels us to believe that the ventral fin is composed of 3 rays covered at the base with a thick skin in such manner as to obscure the third, short one, and to join the other two so that they appear like a single bifid ray. In young individuals of *Phycis chuss*, the third ray has its extremity protruding from the sheath, though in adults it becomes entirely enveloped, thus giving rise to the false definitions which have been given for this genus. An adult specimen of *Phycis furcatus* Flem. (No. 17871 of the National Museum collection), has the third ventral ray protruding.

TABLE OF MEASUREMENTS—continued.

Current number of specimen	21,840. Trawl 174.		21,841. Trawl 194.		21,842. Trawl 194.	
Locality	42 miles E. ½ S., Cape Ann, 140 fathoms, Aug. 27, 1878.		33 miles E. by S., Cape Ann, E. Pt., 110 fathoms, Aug. 31, 1878.			
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Anal:						
Distance from snout	121	50	64	....	57	....
Length of base	108	44	70	....	64	....
Length of first ray	9	4	....	....	....	....
Length of longest ray (37th)	20	8¼	12	....	....	....
Length of last ray	6	2½	....	....	....	....
Caudal:						
Length of middle rays	38	15⅔	23	....	20	....
Length of external rays	36	14⅚	20	....	17	....
Pectoral:						
Distance from snout	60	12⅚	34	....	30	....
Length	52	21½	32	....	29	....
Ventral:						
Distance from snout	54	22⅓	30	....	28	....
Length of first ray	96	39	47	....	42	....
Length of filaments	165	68	81	....	70	....
Length of second ray	15	6¼	10	....	8	....
Branchiostegals	VII	....	7	....	7	....
Dorsal	9 55	....	9–57	....	10 56	....
Anal	47	....	47	....	47	....
Caudal	5–18 5	....	5–21 5	....	5–21 5	....
Pectoral	17	....	17	....	18	....
Ventral	3	....	3	....	3	....
Number of scales in lateral line	90	....	ca. 91	....	ca. 90	....
Number of transverse rows above lateral line	7	....	7	....	7	....
Number of transverse rows below lateral line	28	....	28	....	ca. 28	....

Numerous specimens of this fish were taken at various depths. These collections confirm the view expressed after a study of the collections made by the Fish Commission in the same year; namely, that *Phycis Chesteri* and *Macrurus Bairdii* appear to be the most abundant fishes on the continental slope from 140 to 500 fathoms, occurring in immense numbers and breeding copiously.

The *Blake* obtained examples from station CCCXXXVI, in 38° 21′ 50″ N. lat., 73° 32′ W. lon., at a depth of 197 fathoms, and from station CCCIII, in 41° 34′ 30″ N. lat., 65° 54′ 30″ W. lon., at a depth of 306 fathoms. The *Albatross* from station 2506, in 44° 26′ N. lat., 62° 10′ W. lon., at a depth of 127 fathoms; Cat. No. 33400, U. S. N. M., from station 2053, in 42° 2′ N. lat. 68° 27′ W. lon., at a depth of 105 fathoms; Cat. No. 35655, from station 2232, in 38° 37′ 30″ N. lat., 73° 11′ W. lon., at a depth of 243 fathoms; Cat. No. 35424, U. S. N. M., from station 2175, in 39° 33′ N. lat., 72° 18′ 30″ W. lon., at a depth of 452 fathoms; Cat. No. 35150, U. S. N. M., from station 2183, in 39° 57′ 45″ N. lat., 70° 56′ 30″ W. lon., at a depth of 195 fathoms; Cat. No. 33388, U. S. N. M., from station 2061, in 42° 10′ N. lat., 66° 47′ 45″ W. lon., at a depth of 115 fathoms; Cat. No. 33576, U. S. N. M., from station 2091, in 40° 01′ 50″ N. lat., 70° 59′ W. lon., at a depth of 117 fathoms; from station 2109, in 35° 14′ 20″ N. lat., 74° 59′ 10″ W. lon., at a depth of 142 fathoms; from station 2126, in 36° 1′ 30″ N. lat., 74° 47′ 30″ W. lon., at a depth of 93 fathoms; from station 2469, in 44° 58′ 37″ N. lat., 56° 20′ 45″ W. lon., at a depth of 201 fathoms; from station 2470, in 44° 47′ N. lat., 56° 33′ 45″ W. lon., at a depth of 224 fathoms; from station 2605, in 34° 35′ 30″ N. lat., 75° 45′ 30″ W. lon., at a depth of 32 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2078, in 41° 11′ 30″ N. lat., 66° 12′ 20″ W. lon., at a depth of 499 fathoms; from station 2548, in 39° 56′ N. lat., 70° 14′ 30″ W. lon., at a depth of 200 fathoms; from station 2547, in 39° 54′ 30″ N. lat., 70° 20′ W. lon., at a depth of 390 fathoms; from station 2253, in 40° 34′ 30″ N. lat., 69° 50′ 45″ W. lon., at a depth of 32 fathoms; and from station 2027, in 39° 58′ 25″ N. lat., 70° 37′ W. lon., at a depth of 198 fathoms. The *Fish Hawk* also secured specimens as follows: Cat. No. 31870, U. S. N. M., from station 1152, in 39° 58′ N. lat., 70° 35′ W. lon., at a depth of 115 fathoms; Cat. No. 25902, U. S. N. M., from station 869, in 40° 2′ 18″ N. lat., 70° 23′ 6″ W. lon., at a depth or 192 fathoms; Cat. No. 26204, U. S. N. M., from station 895, in 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., at a depth of 238 fathoms; Cat. No. 28721, U. S. N. M., from station 925, in 39° 55′ N. lat., 70° 47′ W. lon., at a depth of 229 fathoms.

LÆMONEMA, Günther.

Læmonema, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 356.

Body of moderate length, covered with small scales. Fins naked. A separate caudal; 2 dorsal fins and 1 anal, the anterior dorsal composed of 5 rays; ventrals reduced to a single long ray, bifid at its end. Bands of villiform teeth in the jaws; a small group of vomerine teeth; none on the palatine bones. Chin with a barbel. Branchiostegals 7. (*Günther.*)

LÆMONEMA YARRELLII, (LOWE), GÜNTHER.

Phycis Yarrellii, LOWE, Syn. Fish. Mad. (Trans. Zoöl. Soc., II, 190); Fishes of Madeira, 48, pl. VII.
Læmonema Yarrellii, GÜNTHER, Cat. Fish. Brit. Mus., IV, 356 (with a full description).

A *Læmonema* with slender body, and with the anterior rays of the first dorsal prolonged as long as the head. Ventrals prolonged, but not reaching to origin of anal. Anal emarginate, angular behind. Scales small, about 110 in the lateral line and 8 series above it.

Radial formula, D. 5, 59–60; A. 59–60.

Color, reddish-gray. Vertical fins black with white blotches.

This form is known only from Madeira, where it lives at great depths far from the shore, and is exceedingly rare.

LÆMONEMA ROBUSTUM, GÜNTHER.

Læmonema robustum, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, p. 357.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 286.

A *Læmonema* having the anterior rays of the first dorsal prolonged; ventral extending to the eleventh anal ray. About 130 scales in the lateral line, and 13 series between the anterior dorsal and the lateral line.

Radial formula, D. 5,53; A. 47.

This form, first obtained at Madeira, and described by Günther in 1862, was found by the French Expedition at considerable depths off Morocco and the Cape Verde by the *Travailleur*, Station XXXVIII, 1882 in 636 meters and the *Talisman*, Station CX, CXI, CXIII, in 460 to 700 meters.

LÆMONEMA BARBATULA, GOODE and BEAN. (Figures 315–315, A. Young.)

Læmonema barbatula, GOODE and BEAN, Bull. Mus. Comp. Zool., X, 1883, 204.

A *Læmonema* having head contained in body (without caudal) 4⅔ times; height of body 4½ times. Diameter of orbit in length of head 3 times, upper jaw a little more than twice. Barbel half as long as the diameter of the eye. Vent situated under the sixth or seventh ray of second dorsal. Distance of first dorsal from snout equal to one-fourth standard length of body. The base of the first dorsal is half as long as the middle caudal rays; that of the second, slightly more than 3 times the length of the head. The first dorsal is composed of 5 rays, the first of which is elongate, 3 times as long as the middle caudal rays; it extends to the base of the twenty-fourth ray of the second dorsal. Anal fin inserted at a distance from the tip of the snout equal to twice the length of the head, its distance from the insertion of the ventrals being equal to the length of the head. The length of the ventrals is equal to that of the pectorals, their tips not extending to the vent.

Scales small, very thin, deciduous, crowded anteriorly. Lateral line not well defined on the posterior part of the body.

Radial formula: B. VII; D. 5–63; A. 59; P. 19; V. 2. Scales 13–140–31.

Color similar to that of the various species of *Phycis;* the dorsal and anal fins have narrow black margins.

The length of the first dorsal ray is very variable in individuals, being shorter in younger specimens.

This species differs from *L. Yarrellii* by its much smaller scales, and from *L. robustum* by the greater number of rays in the dorsal and anal fins and its much shorter ventrals.

MEASUREMENTS.

	Millimeters.
Extreme length	178
Length to base of middle caudal rays	160
Body:	
Greatest height	36
Greatest width	18
Height at ventrals	32
Least height of tail	4
Head:	
Greatest length	33
Greatest width	20
Width of interorbital area	7
Length of snout	7
Length of upper jaw	15
Length of mandible	17
Distance from snout to orbit	9
Diameter of orbit	11
Dorsal (first):	
Distance from snout	40
Length of base	9
Length of longest ray	54
Dorsal (second):	
Length of base	105
Length of first ray	14
Length of longest ray	17

	Millimeters.
Anal:	
Distance from snout	65
Length of base	86
Length of first ray	7
Length of longest ray	16
Length of last ray	8
Caudal: Length of middle rays	18
Pectoral:	
Distance from snout	36
Length	25
Ventrals:	
Distance from snout	30
Length	25
Branchiostegals	VII
Dorsal	5–63
Anal	59
Caudal	
Pectoral	19
Ventral	2
Number of scales in lateral line ...ca.	140
Number of transverse rows above lateral line	13
Number of transverse rows below lateral line	31

The *Blake* obtained examples of this species from station CCCXXI, in 32° 43′ 25″ N. lat., 77° 20′ 30″ W. lon., at a depth of 233 fathoms; from station CCCXV, in 32° 18′ 20″ N. lat., 78° 43′ W. lon., at a depth of 225 fathoms; and from station CCCXVI, in 32° 7′ N. lat., 78° 37′ 30″ W. lon., at a depth of 229 fathoms. A single specimen was also obtained by the *Fish Hawk* on October 10, 1881 (Cat. No. 29046, U. S. N. M.), at station 1045, in 38° 35′ N. lat., 73° 13′ W. lon., at a depth of 312 fathoms.

LÆMONEMA MELANURUM, GOODE and BEAN, n. s. (Figure 316.)

The specimen described, catalogue number 38270, is 330 millimeters in length; it was obtained by the steamer *Albatross* in N. lat. 30° 44′, W. lon., 79° 26′, station 2415, in 440 fathoms.

The greatest depth of the body (165 millimeters) is contained $4\frac{7}{8}$ times in the length without caudal. The length of the head (68 millimeters) is slightly more than the greatest height of the body. The eye is very large, its length (25 millimeters) about one-third the length of the head and equal to twice the width of the interorbital space. The length of the snout (18 millimeters) is about one-fourth the length of the head. The maxilla extends to below the middle of the eye. The length of the intermaxilla (36 millimeters) is nearly one-half the length of the head. The length of the mandible (38 millimeters) is slightly more than twice the length of the snout. Teeth in the intermaxilla and mandible in villiform bands. Vomerine teeth in a small circular patch on the middle of the head of the bone. The barbel (17 millimeters) is about as long as the snout. The distance of the first dorsal from the tip of the snout is about 4 times the length of the snout. The length of the first ray of the dorsal (54 millimeters) equals that of the head without the snout; the last ray is scarcely more than one-fourth as long as the first.

The ventral consists of a single bifid ray; its distance from the tip of the snout is equal to the length of the head; its length (52 millimeters) is nearly equal to that of the dorsal and the pectoral when extended. It does not reach the vent by a distance equal to the length of the snout. The length of the pectoral (54 millimeters) equals that of the longest dorsal ray, and also equals the head without the snout. The second dorsal is higher anteriorly, and posteriorly much higher, than it is in the middle; the longest anterior ray (26 millimeters) is one-half the length of the ventral, the longest posterior ray (36 millimeters) being one-half the length of the head. The vent is under the eighth ray of the second dorsal. Gill-rakers 5+15; the longest (4 millimeters) one-fourth as long as the snout.

Radial formula: D. 6, 57; A. 55; P. 25; V. 2; Br. 7; Sc. 16–160–38.

Color, very light brown, the dorsals and anal with a narrow dark margin. A conspicuous large, triangular, dark blotch on the last rays of the dorsal and anal, and a dark blotch occupying almost the whole of the caudal, leaving a margin of whitish around it.

In addition to the type, specimens of this species were obtained by the *Albatross* as follows: Cat. No. 39269, U. S. N. M., from station 2416, in 31° 26′ N. lat, 79° 7′ W. lon., at a depth of 276 fathoms; from station 2376, in 29° 3′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms; from station 2379, in 28° 15″ N. lat., 87° 42′ W. lon., at a depth of 1,467 fathoms; from station 2396, in 28° 34′ N. lat., 86° 48′ W. lon., at a depth of 335 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon., at a depth of 280 fathoms; from station 2125, in 11° 43′ N. lat., 69° 9′ 30″ W. lon., at a depth of 208 fathoms, and from station 2219, in 39° 46′ 22″ N. lat., 69° 29′ W. lon., at a depth of 948 fathoms.

MOLVA, Nilsson.

Molva, NILSSON, Skandinav. Fauna, 1832, IV, 573 (type, *Gadus molva* L.).—GÜNTHER, Cat. Fish. Brit. Mus. IV, 361.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 801.—DAY, Fishes of Great Britain and Ireland, 305.

Gadoids having the body elongate, nearly cylindrical. Bands of cardiform teeth in jaws and on vomer, the lower jaw having some large ones, as also has the vomer; the palatine and tongue toothless. Two dorsal fins, both well developed, the first with 10 to 16 rays; and one anal. Ventrals narrow, composed of 6 rays. A barbel present. Scales very small. Branchiostegals seven. Pseudobranchiæ absent.

MOLVA VULGARIS, FLEMING. (Figure 317.)

Gadus molva, LINNÆUS, Syst. Nat., ed. X, 1758, 254; ed. XII, 1766, 439.
Enchelyopus molva, SCHNEIDER, Bloch, Syst. Ichth., 1801, 51.
Lota molva, BONAPARTE, Catalogue, No. 367.—MOREAU, Hist. Nat Poiss. France, III, 258.
Molva vulgaris, FLEMING, British Animals, 192.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 361.—COLLETT, Nyt Mag. f. Naturvid., 1884, 84.—LILLJEBORG, Sverig. och Norg. Fisk., 131.—DAY, *op. cit.*, 305.
Gadus raptor, NILSSON, Prodromus, 46.

A *Molva* having a body 7 or 8 times as long as its own greatest height, and 5 times as long as the head. Upper jaw the longer, the maxillary reaching to below the middle of the orbit. Teeth cardiform in the jaws, with an inner row of rather widely separated and larger ones in the mandible; in a semicircular band on the vomer, among which a few larger ones are interspersed. The first dorsal inserted over the latter half of the pectoral, its greatest height two-fifths of that of the body below it. Pectoral about half as long as the head. Anal insertion in vertical over seventh or eighth ray of second dorsal. Barbel longer than eye, the diameter of the eye being about equal to the width of the interorbital space. Scales small, covering the head, body, and fins.

Radial formula: D. 13–16+63–70. A. 57–66.

Color, back gray, lighter on the sides and beneath; vertical fins edged with white. A dark blotch at the posterior end of the first dorsal, and a more distinct one on the end of the second dorsal.

This fish, the "Ling" of Europe, is found from Spitzbergen to the Gulf of Gascony, where specimens have been taken very exceptionally at Arcachon and San Juan de Luz. It is very rare, however, south of the British Channel, and most abundant along the coast of Northern Europe and about Iceland, especially in the German Ocean and off Norway. It is rare about Iceland, Greenland, and the Faröe Islands, and has never been found in the Baltic. It is said to have been found in the deep water off Newfoundland, but we have been unable to find the specific record. Collett states that on the Norwegian coast young examples rarely occur at less depth than 100 fathoms, and according to Lilljeborg the largest are caught in from 80 to 150 fathoms.

MOLVA BYRKELANGE, WALBAUM.

Molva byrkelange, WALBAUM Artedi's Genera Piscium, 1792, III, 135.—STRÖM. Norsk. Vid. Selsk. Skr., 1884, 35.—COLLETT Norges Fiske, 1875, 116; Nyt Mag. f. Naturvid., 1884, 84.—LILLJEBORG, Sverig. och Norg. Fisk., 139.

Molva abyssorum, NILSSON, Prodromus, 46; Skand. Faun., IV, 577.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 362.

A *Molva* which differs from *M. vulgaris* in having the lower jaw the longer, as well as in longer second dorsal and anal fins. Strong mandibulary and vomerine teeth. Ventral tip not extending beyond that of pectoral. The anal and dorsal terminate in the same vertical.

Radial formula: D. 14+76–78; A. 74–75.

"This species," says Günther, "descends to a still greater depth than the common 'ling,' and is abundant between 100 and 300 fathoms on the coast of Scandinavia."

MOLVA ELONGATA, (OTTO) GÜNTHER.

Gadus elongatus, OTTO, "Conspectus."

Lota elongata, RISSO, Hist. Nat. Eur. Mérid., 217, fig. XLVII.—BONAPARTE, Catalogue, No. 368.—CANESTRINI, Archive Zoologique, II, 367.—MOREAU, Hist. Nat. Poiss., France, III, 260, fig. 179.

Molva elongata, GÜNTHER, Cat. Fish. Brit. Mus., IV, 362.—CANESTRINI, Faun. Italica, 157.—GIGLIOLI, Elenco, 37.

A *Molva* characterized by the length of the pectoral fin, which extends further backward than the ventral, while the anal extends further backward than the dorsal; also by the comparative shortness of the first dorsal fin. The lower jaw is longer than the upper one. The length of the barbel is not quite half the width of the interorbital space. The anal is inserted behind the vertical from the origin of the second dorsal. The first three rays of the ventral are elongated.

Radial formula: D. 10–11+77–81: A. 73–78.

Color above, ashy; below, silvery white. The dorsal and caudal are margined with black; white at the edge. The second dorsal has on its posterior rays a very black spot. The caudal is black at its lower posterior angle.

This form is found only in the Mediterranean, and is very common at Nice. It occurs off the west coast of Italy, though it is not abundant. Giglioli also records it from Messina, where it is rare.

PHYSICULUS, KAUP.

Physiculus, KAUP, Wiegmann's Archiv., 1858, 88.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 348; Challenger Report, XXII, 1887, 87.

Pseudophycis, GÜNTHER, Cat. Fish. Brit. Mus., IV, 350.

Gadoids having an elongate body, 2 dorsals and 1 anal fin, and a separate caudal. Snout broad, obtusely rounded, projecting beyond the mouth, which is of moderate size. Teeth small, villiform, of equal size, in bands in the jaws; vomerines and palatines toothless. Scales very small, covering body and entire head. Ventrals narrow, with 5 rays, the outer ones filamentous. Anal not notched. Caudal rounded, slender, free. A barbel upon the chin. Branchiostegals 7. Gill-rakers of the outer branchial arch short.

Günther, in his report on the deep-sea fishes of the *Challenger*, combines his genus, the *Pseudophycis*, with *Physiculus*, stating that in consequence of the discovery of several intermediate forms, a generic distinction between them can not be maintained; and further that most probably the transition from the perfectly developed many-rayed fin to the single filament of *Phycis*, will be found to be so gradual as to diminish the value of the structure of this fin as a taxonomic character in this group.

In addition to the four species described below, two other species have been described—*P. breviusculus* of Richardson (=*P. bacchus*, Forster), and *P. barbatus* of Günther (=*P. palmatus*, Klünzinger), but their bathic range has not been determined.

PHYSICULUS DALWIGKII, KAUP.

Physiculus Dalwigkii, KAUP, *loc. cit.*—GÜNTHER, Cat. Fish. Brit. Mus., IV, 348 (full description); Challenger Report, XXII, 1887, 88.—VAILLANT, Exp. Sci., Travailleur et Talisman, 1888, 290, pl. XXV, figs. 3–3c.

"Eleven series of scales between the anterior dorsal and the lateral line. Axil of the pectoral black. D. 7/67: A. 69: V. 5." (*Günther.*)

Günther has studied 3 specimens from Madeira, the largest 10 inches long, and notes that all have an exceedingly narrow base to the ventral fin.

The species is only known from Madeira and from off Soudan, where the *Talisman* obtained it at two stations, LXII, 782 meters, and LXXI, 640 meters.

PHYSICULUS KAUPI, POEY. (Figure 318.)

Physiculus Kaupi, POEY, Report. Fis. Nat. Cuba, 1865, 186, pl. IV, fig. 1.—GÜNTHER, Challenger Report, XXII, 1887, 88, pl. XVII, fig. A.
? *Physiculus japonicus*, HILGENDORF, SB. Naturf. Freunde, Berlin, 1879, 80.—(*fide* Günther).

"This species," writes Günther, "has constantly (as far as is shown by our specimens) a broader base to the ventral fins than *Physiculus dalwigkii*, and they are formed of 7 rays, of which the longest may or may not reach the anal fin. The fin rays vary within proportionate limits; they are: D. 9–10 | 60–66; A. 60–70. There are 13 series of scales between the anterior dorsal and the lateral line. The peduncle of the tail is shorter and less slender than in the Madeiran form, but otherwise the two species are so similar as to scarcely deserve specific separation."

Poey obtained a specimen at Cuba, and Melliss two at St. Helena. These are pronounced by Günther to differ in no respect from five examples found by the *Challenger* off Inosima in 345 fathoms, and 11 to 16 inches long.

PHYSICULUS PEREGRINUS, GÜNTHER.

Pseudophycis peregrinus, GÜNTHER, Proc. Zool. Soc. London, 1871, 669.
Physiculus peregrinus, GÜNTHER, Challenger Report, XXII, 1887, 88.

The height of the body is less than the length of the head, which is two-ninths of the total (without caudal). Vent at only a short distance behind the base of the pectoral; tail tapering into a very narrow band, the extremity of which is surrounded by the caudal fin; however, the vertical fins remain separate from one another. Head rather broader than deep, its greatest width being two-thirds of its length. Interorbital space concave, its width being less than the diameter of the eye, which is one-fourth of the length of the head, and equals that of the snout. Snout broad, obtuse, rounded, with the upper jaw overlapping the lower; the maxillary extends to below the middle of the eye. Barbel shorter than the eye. Vertical fins of moderate depth, with very fine fin-rays; the first dorsal commences opposite to the base of the pectoral. Pectoral as long as the head without snout. The ventral filament is jugular, extending beyond the origin of the anal, and composed of one longer and two shorter rays. Scales minute and deciduous.

Radial formula: D. 7+62 (ca.); A. 66 (ca.); V. 3.

Color reddish olive (in spirits), abdomen black.

The British Museum has several examples of this species from Manado, one of which measures 5 inches in length.

Another species, *P. palmatus*, Klünzinger, is from Port Philip, Hobson Bay—probably not a deep-sea form.

PHYSICULUS FULVUS, BEAN. (Figure 319.)

Physiculus fulvus, BEAN, Proc. U. S. Nat. Mus., 1884, VII, 240.

A *Physiculus* with head broad and depressed, with a short snout; the length of the head contained in the total length to the caudal base nearly 4 times. The height of the body is about equal to the length of the head without the snout, and is contained $4\frac{2}{3}$ times in the total length without caudal. The eye is about two-sevenths as long as the head.

The length of the upper jaw is about equal to the space between the ventrals and the anal origin, and is contained 2¼ times in that of the head. The maxilla does not quite reach the vertical through the hind margin of the eye. The barbel is one-sixth as long as the head. The teeth are in narrow bands in the jaws; there is no outer series of enlarged teeth, but a few in the middle of the bands in both jaws are slightly larger than the others; all of the teeth, however, are inconspicuous; the vomer and palate are smooth. The vent is situated about under the third ray of the first dorsal. The distance of the first dorsal from the tip of the snout equals 3 times the length of its base; its longest ray equals twice the length of the snout, and slightly exceeds the length of the longest of the second dorsal; the length of the second dorsal base equals 3 times the length of the pectoral, which is contained nearly 5½ times in the total without caudal. The origin of the anal is about in a vertical let fall from the base of the fifth ray of the first dorsal. The distance of the ventral from the tip of the snout is contained about 5⅔ times in the standard body-length. When the ventral is extended backward its tip will reach the base of the fourth anal ray. The length of the middle caudal ray is one-third of the length of the head. The lateral line is very indistinct, but it is situated rather high, and follows pretty closely the contour of the back. The gill-rakers are moderately short and not numerous.

Radial formula: D. 10+49; A. 54; V. 7; scales 6–61 to 62–16.

The general color is a light yellowish-brown with the under surface of the head, the abdomen, the margins of the dorsal and anal fins, the lips, and the axil of the pectoral very dark brown. There is, also, a dark brown blotch on the subopereulum. The inside of the mouth and of the gill-membranes is white.

The type of this species (Cat. No. 28766, U. S. N. M.) was taken by the *Fish Hawk* from station 941, in 40° 1′ N. lat., 69° 56′ W. lon., at a depth of 79 fathoms. Specimens were also obtained by the *Blake* at station CCXXXVIII, in 24° 36′ N. lat., 84° 5′ W. lon., at a depth of 955 fathoms; and by the *Albatross* from station 2358, in 20° 19′ N. lat., 87° 3′ 30″ W. lon., at a depth of 222 fathoms; from station 2312, in 32° 54′ N. lat., 77° 53′ 30″ W. lon., at a depth of 88 fathoms; from station 2298, in 35° 39′ N. lat., 74° 52′ W. lon., at a depth of 80 fathoms; and from station 2402, in 28° 36′ N. lat., 85° 33′ 36″ W. lon., at a depth of 111 fathoms.

URALEPTUS, Costa.

Uraleptus, COSTA, Wiegmann's Archiv., 1858, 87.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 349.

Body elongate, compressed and tapering posteriorly, covered with small scales. A separate caudal; 2 dorsal fins and 1 anal; ventral fins narrow, with flat base, composed of 6 rays. Upper and lower jaw with an outer series of strong curved teeth. Vomerine and palatine teeth none. Chin without barbel. Branchiostegals seven. (*Günther.*)

URALEPTUS MARALDI, (RISSO), COSTA. (Figure 320.)

Gadus Maraldi, RISSO, Ichth. Nice, 1810, 123, pl. VI, fig. 13.
Merlucius Maraldi, RISSO, Hist. Nat. Eur. Mérid., 220.
Uraleptus Maraldi, COSTA, Fauna Napol., pl. XXXVII, A.—BONAPARTE, Cat. Metodico, No. 375.—CANESTRINI, Arch. Zool., I, 357; Pesci d'Italia, 156.—GÜNTHER, *loc. cit.*; Challenger Report, XXII, 1887, 87.—MOREAU, Hist. Nat. Poiss. France, III, 253.
Gadus gracilis, LOWE, Proc. Zool. Soc. London, 1843, 91 (type in University of Cambridge).

The head is rather thick, its greatest width being equal to its height, which is somewhat more than one-half of its length; its length is one-fourth of the total (without caudal). The cleft of the mouth is oblique, wide, the maxillary extending to below the posterior margin of the orbit. The lower jaw is received within the upper, but both are nearly equal in length anteriorly; they are armed with a series of rather large, curved, widely set teeth, and there is another series of small teeth within the outer in the upper jaw. Snout rather broad, obtusely rounded, scarcely longer than the eye, the diameter of which is two-ninths of the length of the head. The interorbital space is emarginate on each side by the upper part of the orbit, and its width is somewhat more than the diameter of the eye. Nape of the neck broad, scarcely elevated, with a spine on each side pointing outwards and covered by skin. Operculum small, with a slender horizontal spine posteriorly, the part below the spine being emarginate. Gill-membranes united below the throat by a rather narrow cutaneous bridge, not attached to the isthmus. Gill-opening wide; gills 4, a slit behind the fourth; pseudobranchiæ glandular. The trunk is rather low, its greatest depth being one-sixth of the total (without caudal). Tail tapering into a very narrow band. The first dorsal fin commences behind the vertical from the base of the pectoral, is somewhat higher than long, and not higher than the second. The second dorsal commences immediately behind the first; its rays increase somewhat in length posteriorly, one of the longest being half as long as the head. The whole fin is naked. Caudal fin slender, slightly rounded, entirely free from dorsal and anal, and nearly half as long as the head. The anal fin commences at some distance behind the vent, which is situated vertically below the origin of the first dorsal; it is very similar to the second dorsal. The pectoral is inserted somewhat below the middle of the body, and its length equals the distance between the front margin of the eye and the end of the operculum. Ventrals narrow, slender, with the outer ray produced into a filament shorter than the pectoral.

The scales extend over the whole head, the chin and the thin lips being naked. (*Günther.*)

This form, originally described from Nice, has since been found at Madeira by Johnson, and at Naples and Catania by Giglioli.

The *Blake* obtained a poor specimen, apparently of this form, at station LXXXI, off the Island of Nevis, in the West Indies.

LOTELLA, Kaup.

Lotella, KAUP, in Wiegm. Arch., 1858, p. 88.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 346; Challenger Report, XXII, 1887, 86, pl. XIV, fig. A. (*Lotella marginata.*)

Body of moderate length, covered with small scales. A separate caudal; 2 dorsal fins and 1 anal; ventral fins with a flat base and composed of several rays. Teeth in the upper jaw in a band, with an outer series of larger ones. Vomerine or palatine teeth, none. Chin with a barbel. Branchiostegals 7 (6?). (*Günther.*)

Five species of this genus are known: *L. phycis* (Schlegel), Günther, from Japan; *L. rhachinus* (Forster) Günther, from Queen Charlottes Sound; *L. fuliginosa*, described by Günther from a specimen without locality in the British Museum; *L. maxillaris*, Bean, doubtfully referred to this genus, and *L. marginata*, Günther, from 140–345 fathoms, off the Pacific Coast of southwestern South America.

LOTELLA MAXILLARIS, BEAN. (Figure 321.)

Lotella maxillaris, BEAN, Proc. U. S. Nat. Mus., VII, 1889, 241.—GÜNTHER, Challenger Report, XXII, 1887, 86. —JORDAN, Cat. Fish. N. America, 1885, 130.

A *Lotella* having the length of its moderately compressed head contained about 4⅓ times in the total length without caudal; the height of the body 5 times. Snout short. The eye is one third as long as the head. The maxilla reaches to the vertical through the anterior margin of the pupil; its length equals that of the postorbital part of the head. The teeth are in narrow bands in the jaws, the outer series being enlarged. The vomer and palate seem to be without teeth. The vent is situated about under the eighth ray of the second dorsal. The distance of the first dorsal from the tip of the snout is contained 4 times in the total length, including caudal. The ventrals extend to about the vertical from the origin of the second dorsal, and do not reach nearly to the vent. The longest ray of the first dorsal is a little more than one-half as long as the head. None of the rays of the second or of the anal are as long as the first ray of the first dorsal. The longest ray of the second dorsal does not much exceed one half the height of the body. The longest ray of the anal is about one-half the length of the ventral. The origin of the anal is about under the tenth ray of the second dorsal. The ventrals are situated about under the beginning of the posterior third of the head; their length equals one fourth of the length of the second dorsal base. The origin of the pectoral is somewhat in advance of that of the first dorsal. The fin is imperfect, but its length probably slightly exceeds that of the ventral. The caudal is rounded.

Radial formula: D. 5, 55; A. 44; V. 10.

Owing to the condition of the specimen it is very difficult to count the small scales, but there are about 7 or 8 rows between the origin of the first dorsal and the lateral line, and about 14 or 15 rows between the anal and the lateral line. The number in the lateral line is at least 115 to the origin of the caudal.

The color of the type at present is a very light brown. The margins of the dorsal and anal, in their posterior portions, are blackish.

A single individual was taken by the *Fish Hawk*, August 23, 1881, at station 952, in N. lat. 39° 55′ and W. lon. 70° 28′, in 396 fathoms. The specimen is only 2⅜ inches in length. The catalogue number of the type is 29832. It is No. 14 of the list of fishes published by Prof. Verrill (Amer. Jour. Sci. and Arts, Vol. XXII, 1881, p. 296).

MORA, Risso.

Mora, RISSO, Hist. Nat. Eur. Mérid., 1826, III, 224.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 341.—MOREAU, Hist. Nat. Poiss., France, III, 248.

Asellus, VALENCIENNES, Nat. Hist. Iles Canariennes, Poissons, 76.

Pharopteryx, RÜPPELL, Verzeichn. Mus. Senckenb., Fische, 16.

Gadoids having moderately elongate, Phycis-like body. Dorsals separate, prominent; a short anterior and a long posterior dorsal, and the anal in two parts, widely separated. Ventrals composed of 6 rays. Scales moderate, covering body and head. Mouth large, subinferior; teeth on jaws, vomer, and palatines cardiform, equal, those in the upper jaw in a band. Gill-openings large. Branchiostegals 7.

MORA MEDITERRANEA, Risso. (Figure 322.)

Gadus mora, RISSO, Ichth. Nice, 1810, 116.

Mora mediterranea, RISSO, Hist. Nat. Europ. Méridionale, III, 224.—BONAPARTE, Catalogue, No. 370; Fauna Italica, figure.—LOWE, Proc. Zoöl. Soc. London, 1843, 91.—CANESTRINI. Arch. Zoöl., II, 359, pls. XI-XII, fig. 1; Pesci d'Italia, 155.—GIGLIOLI, Elenco, 36.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 342; Challenger Report, XXII, 83.—CAPELLO, Cat. Peixes do Portugal, 1880, 30, No. 141.—MOREAU, Hist. Nat. Poiss., France, III, 248, fig. 177.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 298, pl. XXV, figs. 6, 6a.

Asellus canariensis, VALENCIENNES, loc. cit., 76, pl. XIV, fig. 3.

A *Mora* having the upper jaw longer than the lower, and a slender barbel, whose length is less than that of the diameter of the eye. Caudal forked. First ventral ray prolonged in a slender thread, which reaches behind the tip of the pectoral. Scales small, 95 in the lateral line.

Radial formula: D. 7-8+42-45; A. 17-19+15-22; V. 6.

Color chestnut-brown upon the back, dark ash color on the belly, a blue spot upon the tip of the operculum. The palate and tongue are dark blue, the latter with black spots. Dorsal and anal light blue at the base, darker at the tip. Pectorals light blue with black spots.

This species, the *Mora* of Nice and the *Verdone* of Rome, was first found in the Mediterranean, where it has been recorded from Nice, Genoa and Leghorn. Risso said of it in 1810 that it was very common in great depths of the sea off Nice, where it is taken in the month of August. Giglioli, fishing at Genoa, July 26, 1879, at a depth of 800 to 1,000 meters, captured ninety-seven. It has not been found in the Adriatic, but Brito Capello records it from off the coast of Portugal, and Lowe, also from 300 to 400 fathoms off Magdalena, 5 leagues to the west of Funchal, while Webb and Berthelot obtained it at the Canaries. The *Talisman* took it at the same region (station L) at 975 meters, as well as off Morocco (stations IX, XI, XXXIV, XLVII, XLVIII) at depths of from 622 to 1,180 meters. The *Travailleur* obtained it at Setubal (stations XXXIV and XXXV) in 1,367 meters, and in the Gulf of Gascony in 614 meters. The *Challenger* obtained specimens also, but they were destroyed on shipboard and the record of locality lost. It has never been found in the Western Atlantic.

LEPIDION, Swainson.

Lepidion, SWAINSON, Nat. Hist. Fishes, etc., I, 1838, 318; II, 1839, 188, 300.
Haloporphyrus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 358.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 800.

Gadoids having an elongate, compressed, hake-like body. Scales very small, covering not only the body but the entire head, even to the gill-membranes. Snout produced, depressed. Mouth rather large, subinferior. Jaws with bands of villiform teeth; vomerine teeth in a small roundish patch; palatines toothless. Dorsal composed of a very short and a very long division. The anterior ray of the first dorsal filamentous and produced. Anal deeply notched. Ventrals narrow, composed of 6 rays, one of them filamentous. Caudal truncate. A barbel upon the chin. Branchiostegals 7.*

LEPIDION RISSOI, SWAINSON. (Figure 323.)

Gadus lepidion, RISSO, Ichth. Nice, 1810, 118, pl. XI, fig. 40.
Lota lepidion, RISSO, Hist. Nat. Eur. Mérid., III, 1826, 218.—BONAPARTE, Catalogo Metodico, 44.
Lepidion Rissoi, SWAINSON, *op. cit.*, I, 1838, 319.
Lepidion rubescens, SWAINSON, *op. cit.*, II, 1839, 307.
Haloporphyrus lepidion, GIGLIOLI, Nature, January 1, 1880.—VINCIGUERRA, Ann. Mus. Civ. Genoa, XVIII, 558, taf. III.—GÜNTHER, Challenger Report, XXII, 91.—CANESTRINI, Pesci d'Italia, 157.

A *Lepidion* having a broad, thick, flat head, covered with scales, and with an occipital keel. The length of the head contained 4½ times in the total length of the fish. Snout depressed, short, obtuse. Mouth broad, its angle under the anterior portion of the orbit. Upper jaw broad, longer than the mandible. Teeth small, cardiform, on the jaws and vomer. Eye large, round, its diameter contained 3½ times in the length of the head, and nearly equal to the length of the snout. Tip of maxillary extending beyond vertical from the middle of the orbit. Scales very small, from 155 to 160 in the lateral line, and about 11 longitudinal rows between the first dorsal and the lateral line, which is a little curved anteriorly, but straight after it passes the vertical from the origin of the anal. The first dorsal placed far forward, in vertical from the insertion of the pectorals; it is composed of only 4 rays, the first of which is much prolonged; its length two-fifths the total length of the fish. The second dorsal with a very long base. The median rays of the anal are much shorter than the others, giving it a crescentic emarginate outline. Caudal long, rounded. Ventrals very long, their tips reaching the anus, but rarely extending beyond those of the pectoral rays.

Radial formula: D. 4+52; A. 46–48; V. 6.

Color, grayish-brown with a reddish tint. The second dorsal blue, edged with black; the other fins more or less brown in alcoholic specimens. The caudal and anal blackish, as are the opercles.

This species, originally described from Nice in 1810, was said by Risso to be very rare, and only taken at considerable depths in the month of August. It has never been seen elsewhere than at Nice, where Giglioli obtained specimens in September, 1879.

The Madeiran form identified with this by Günther before he had had the opportunity of examining a specimen, has since been determined to be distinct, and was renamed by Giglioli, *Haloporphyrus Güntheri*.

LEPIDION GÜNTHERI, (GIGLIOLI), GOODE and BEAN.

Haloporphyrus lepidion, GÜNTHER, Cat. Fish. Brit. Mus., IV, 358.—JOHNSON, Ann. and Mag. Nat. Hist., 1862, X, 166.
Haloporphyrus Güntheri, GIGLIOLI, Nature, January 1, 1880.—VINCIGUERRA, Ann. Mus. Civ. Genoa, XVIII, 558.—GÜNTHER, Challenger Report, XXII, 90, pl. XVIII, fig. A.

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* According to Dr. Günther (v. 4, p. 358), "the generic name *Lepidion* is preoccupied," but it is not stated in what way. When it is remembered that *Dactylopus* was said to be preoccupied because Meyer had named a group of extinct reptiles *Dactylopoda*. It will be understood why as no record of an earlier use of *Lepidion* than 1838 appears in the nomenclators, we must adopt it till further information is given as to the nature of the supposed preoccupation. Savigny had given the name *Lepidia* to a genus of worms in 1817, and Lepelletier had named *Lepisia* a genus of beetles in 1825, but those are sufficiently distinct from the Swainsonian name. —GILL.

The diameter of the eye is one-sixth the length of the head (in specimens 20 to 24 inches long). Caudal peduncle rather slender, its depth being two-thirds of the distance between dorsal and caudal fins. Fifteen or 16 longitudinal series of scales between the anterior dorsal fin and the lateral line, and 210 in the lateral line. The dorsal filament very thin, thread-like. (*Günther.*)

Radial formula: D. 4+52–56; A. 49–52; P. 21; V. 5.

This species has, according to Günther, been obtained off the coasts of Madeira and Portugal, and also in the Mediterranean. One of the specimens in the British Museum, that figured by Günther in the *Challenger* report, was 2 feet long.

LEPIDION EQUES, (GÜNTHER), GOODE and BEAN.

Haloporphyrus eques, GÜNTHER, Challenger Report, XXII, 91, pl. 18, fig. B.

The length of the head equals the distance between the root of the ventral fin and the anal, and is rather less than one-fourth of the total (without caudal). The eye is very large, one-third of the length of the head, longer than the snout, and nearly twice the width of the interorbital space. Snout of moderate length, obtuse, with an undulated series of pores in the preorbital region running toward the extremity of the snout. The mouth extends nearly to below the middle of the eye. Barbel half the length of the eye. The caudal peduncle very slender, its depth being two-fifths of the distance between dorsal and caudal fins. Fifteen or 16 longitudinal series of scales between the anterior dorsal fin and the lateral line and 180 in the lateral line. The first long dorsal ray is compressed, moderately strong, extending backward to the posterior fourth of the length of the dorsal fin. The middle of the anal fin very conspicuously depressed. Caudal fin rounded, with its basal rays extending for some distance along the peduncle. Pectoral fin as long as the head without snout. The filamentous ventral ray, which, in fact, consists of two rays, free along their distal half, does not exceed in length the pectoral fin. Cæc. pyl. 10–11.

Radial formula: D. 4+56–62; A. 49–54; V. 7; L. lat. 180.

Color, brownish with blackish fins; orbit with a black ring; the cavities of the mouth, gills, and abdomen black. Specimens of a much lighter color (probably albinos) are not scarce. (*Günther.*)

Young specimens (6 inches in length), says Günther, do not differ essentially from older ones of twice the length, but their eye is relatively still larger and the dorsal filament somewhat smaller. Numerous specimens were obtained by the *Knight Errant*, in the Faröe Channel, in 530 fathoms, the largest being 12 or 13 inches long, at station 6, in August, 1880, and station 2, in August, 1882.

Günther formerly believed that these specimens represented the younger stage of the large specimen from Madeira (the only one known to him at the time) which he referred in 1862 to Risso's fish; but examples received at a later period convinced him that the present species may be constantly, at all ages, distinguished by a comparatively larger eye and shorter head. However, the three European species, viz, *Lepidion Güentheri*, *Lepidion Rissoi*, and *Lepidion eques* are most closely allied to each other.

LEPIDION ENSIFERUS, (GÜNTHER), GOODE and BEAN.

Haloporphyrus ensiferus, GÜNTHER, Challenger Report, XXII, 1887, 92, pl. XIX, fig. A.

Distinguished by the very broad and compressed dorsal ray. The length of the head equals the distance between the root of the ventrals and the vent. Eye rather large, two-sevenths of the length of the head, a little longer than the snout, and in width much exceeding the interorbital space; pores of the preorbital region very small. Mouth comparatively narrow, only reaching beyond the anterior margin of the eye; barbel much shorter than the eye. Caudal peduncle rather slender, its depth being rather more than one-half the distance between dorsal and caudal fins. Scales very small, rather irregularly arranged; about 18 longitudinal series between the first dorsal fin and the lateral line. The long dorsal ray is strongly compressed, broad, shaped like a blade of grass, and extending backward to the posterior third of the dorsal fin. It is so in 3 male specimens, but in a female the ray is much less developed, scarcely extending beyond the anterior third of the dorsal fin. Middle of the anal fin strongly depressed; caudal fin subtruncated; pectoral as long as the head without snout, much shorter than the filamentous ventral fin, which, however, does not reach the vent. (*Günther.*)

Radial formula: B. 7; D. 5, 52; A. 46; V. 8; Cæc. pyl. 10.

Color, brownish, fins blackish, the posterior dorsal and anal rays whitish; cavities of the mouth, gills, and abdomen black. (*Günther.*)

This species was obtained by the *Challenger*, at station 320, off the mouth of the La Plata, and is described and figured by Günther (Challenger Report, XXII, 1887, 92, pl. XIX, fig. A).

ANTIMORA, Günther.

Antimora, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 18; Challenger Report, XXII, 93.

Body elongate, covered with small scales. Upper part of the snout produced into a pointed projection. A separate caudal; 2 dorsal fins, the first with 4 or 5 rays; one anal, with a deep depression along the middle. Ventrals narrow, composed of 6 rays. Jaws with bands of villiform teeth; vomerine teeth in a small roundish patch; none on the palatine bones. Muciferous channels on the side of the head well developed; bones of the cranium wanting in solidity. Vent at the end of the abdominal cavity. Chin with a barbel. Branchiostegals 7; pseudobranchiæ none. Pyloric appendages long, in moderate number.

ANTIMORA VIOLA, (GOODE and BEAN), JORDAN. (Figure 324.)

Haloporphyrus viola, GOODE and BEAN, Proc. U. S. Nat. Mus., I, sig. 17, Dec. 17, 1878, 257; Cat. Fish. Essex Co. and Mass. Bay, 1879, 8; Bull. Mus. Comp. Zoöl., X, 1883, 206; Amer. Jour. Sci. and Arts, XVII, 1879, 41.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 800.—GOODE, Proc. U. S. Nat. Mus., III, 476.

Antimora viola, JORDAN, Cat. Fish. N. Amer., 129.—GÜNTHER, Challenger Report, XXII, 1887, 94, pl. XV.

An *Antimora* with body resembling that of *Phycis*, though somewhat shorter, higher, and more compressed, its greatest height contained about five times in its length (without caudal), its height at the ventrals slightly exceeding one-eighth of its total length, its height at the middle of the caudal peduncle one twenty-ninth of the same.

Scales arranged in about 115 vertical rows and about 38 horizontal ones, about 11 being between the origin of the dorsal and the lateral line and about 27 below the lateral line. Lateral line slightly curved upward in the anterior fourth of its length.

Length of head contained more than four and one-quarter times in that of the body; its width half its length and less than double that of interorbital area.

The barbel is short, its length being scarcely equal to half the diameter of the orbit and about one-tenth the length of the head. The width of interorbital area is about equal to the longitudinal diameter of the orbit, in the larger specimen slightly greater. The diameter of the orbit is equal to or slightly greater than one-fourth the length of the head. The length of the snout is equal to that of the operculum and less than width of interorbital area.

The maxillary extends to vertical from posterior margin of the orbit, its length about equal to the greatest width of the head. Mandible equals one eighth of total length without caudal.

Snout equal to operculum in length, obtusely pointed, much depressed, its lateral outline subconical, a conspicuous keel extending backward along the lower line of the orbit to its posterior margin. The head and mouth closely resemble those of some species of *Macrurus*, except that the keel is covered with small, smooth scales and is not overhanging. Lips scaleless.

Teeth in the jaws imperfectly serial, villiform, recurved; a small oblong patch of similar teeth on the head of the vomer; none on the palatines.

First dorsal fin inserted at a distance from the snout somewhat greater than twice the height of the body at the ventrals; its first ray is much prolonged, its length greater than that of the head, and nearly as long as or longer (in the larger specimen) than the distance from the snout to the beginning of the dorsal. The second ray is contained less than four times, the third six times or less in the first, the fourth about ten times. The length of the base of second dorsal is somewhat more than twice the distance of its insertion from the snout; its greatest height, which is in the posterior fourth of its length (near the 40th ray), is contained about six or seven times in the length of its base.

The vent is situated at a point equidistant from snout and tip of caudal, under the 19th ray of second dorsal fin. The anal fin is inserted at a distance behind it equal to length of second anal ray. Its length of base is slightly more than half that of second dorsal. It has a considerable depression in its middle outline. The last rays of dorsal and anal are of equal length and are directly opposite each other.

The caudal seems to be somewhat rounded. The length of the middle rays contained more than 9 times in total length without caudal, and more than 10 times in length including caudal.

Pectorals narrow, inserted under the base of first dorsal. In the smaller specimen they reach to the perpendicular from the ninth ray of the second dorsal, in length equaling the greatest height of the body.

Ventrals inserted at a distance from tip of snout equal to half the length of anal base; the second ray nearly twice as long as the first, and in the smaller specimen, in which it is unmutilated, nearly as long as the head.

Radial formula: D. 4, 53; A. 40; C. 5, 20 or 21, 5; P. 1, 19; V. 6.

Color, deep violet or blue.

TABLE OF MEASUREMENTS.

Current number of specimen	21,837		21,838	
Locality	Edge of Le Have Bank.			
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length (without caudal)	435		545	
Length to end of middle caudal rays	480		603	
Body:				
Greatest height	ca. 83	19		
Greatest width	44	10		
Height of ventrals	55	12½		
Least height of tail	15	3½		
Length of caudal peduncle	19	4½		
Head:				
Greatest length	100	23	125	23
Length of barbel	10	2¼	13	2½
Greatest width	50	11½	63	11½
Width of interorbital area	27	6¼	35	6½
Length of snout	25	6	27	5
Length of operculum	25	6	27	5
Length of maxillary	49	11	62	11½
Length of mandible	55	12½	74	13
Distance from snout to center of orbit	44	10	50	9½
Diameter of orbit (longitudinal)	27	6¼	32	6
Dorsal (first):				
Distance from snout	113	26	136	25
Length of base	16	4	25	4½
Length of first ray	107	24½	140	25½
Length of second ray	25	6	33	6
Length of third ray	19	4½	22	4
Length of fourth ray	10	2¼	14	2½
Dorsal (second):				
Length of base	273	62¾	340	62
Distance from snout	133	30½	160	29
Length of first ray	27	6¼	33	6
Length of longest ray (41st)	32	7¼	53	9¾
Length of last ray	8	2		
Anal:				
Distance from snout	266	61		
Length of base	142	32½		
Length of first ray	10	2¼		
Length of longest ray (26th)	36	8		
Length of last ray	8	2		
Caudal:				
Length of middle rays	ca. 45	10¼	ca. 58	10½
Pectoral:				
Distance from snout	104	23¾	137	25
Length	83	19	105	19
Ventral:				
Distance from snout	71	16		
Length of first ray	48	11	52	10
Length of second ray	92	21		
Branchiostegals		VII		VII
Dorsal		4, 53		4, †
Anal		40		40
Caudal		5, 20 or 21, 5		
Pectoral		1, 19		1, 19
Ventral		6		
Number of scales in lateral line		ca. 115		
Number of transverse rows above lateral line		ca. 11		
Number of transverse rows below lateral line		ca. 27		

The types of this species were brought into Gloucester August 24, 1878, by Capt. Joseph W. Collins, the skipper of the schooner *Marion* of Gloucester, having been taken on a halibut trawl on the outer edge of Le Have Bank at a depth of 400 or 500 fathoms.[1]

Other specimens were taken by the *Fish Hawk* on October 2, 1880, at station 893, in 39° 52′ 20″ N. lat., 70° 58′ W. lon., at a depth of 372 fathoms.

Other specimens were obtained by the *Blake* from station CCCV, in 41° 33′ 15″ N. lat., 65° 51′ 25″ W. lon., at a depth of 810 fathoms; from station CCCVIII, in 41° 24′ 25″ N. lat., 65° 35′ 30″ W. lon., at a depth of 1,242 fathoms; from station CCCVI, in 41° 32′ 50″ N. lat., 65° 55′ W. lon., at a depth of 524 fathoms; from station CCCXXV, in 33° 35′ 20″ N. lat., 76° W. lon., at a depth of 347 fathoms; from station CCCXII, in 39° 50′ 45″ N lat., 70° 11′ W. lon., at a depth of 466 fathoms; from station CCCXXXVII, in 38° 20′ 8″ N. lat., 73° 23′ 20″ W. lon., at a depth of 740 fathoms, and from station CCCIII, in 41° 34′ 30″ N. lat., 65° 54′ 30″ W. lon., at a depth of 306 fathoms; by the *Albatross* from station 2571, in 40° 9′ 30″ N. lat., 67° 9′ W. lon., at a depth of 1,356 fathoms; Cat. No. 35433, U. S. N. M., from station 2181, in 39° 29′ N. lat., 71° 46′ W. Lon., at a depth of 693 fathoms; Cat. No. 33373, U. S. N. M., from station 2075, in 41° 40′ 30″ N. lat., 65° 35′ W. lon., at a depth of 855 fathoms; Cat. No. 33275, U. S. N. M., from station 2035, in 39° 26′ 10″ N. lat., 70° 2′ 37″ W. lon., at a depth of 1,362 fathoms; Cat. No. 33446, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 33412, U. S. N. M., from station 2074, in 41° 43′ N. lat., 65° 21′ 50″ W. lon., at a depth of 1,309 fathoms; Cat. No. 35425, U. S. N. M., from station 2179, in 39° 30′ 10″ N. lat., 71° 50′ W. lon., at a depth of 510 fathoms; Cat. No. 33375, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 35431, U. S. N. M., from station 2171, in 37° 59′ 30″ N. lat., 73° 48′ 40″ W. lon., at a depth of 444 fathoms; Cat. No. 35543, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; Cat. No. 33014, U. S. N. M., from station 2030, in 39° 29′ 45″ N. lat., 71° 43′ W. lon., at a depth of 588 fathoms; from station 2529, in 41° 3′ 30″ N. lat., 66° 14′ W. lon., at a depth of 662 fathoms; from station 2083, in 40° 26′ 40″ N. lat., 67° 5′ 15″ W. lon., at a depth of 959 fathoms; from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; from station 2111, in 35° 9′ 50″ N. lat., 74° 57′ 40″ W. lon., at a depth of 938 fathoms; from station 2563, in 39° 18′ 30″ N. lat., 71° 23′ 30″ W. lon., at a depth of 1,422 fathoms; from station 2534, in 40° 1′ N. lat., 67° 29′ 15″ W. lon., at a depth of 1,234 fathoms; from station 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., at a depth of 667 fathoms; from station 2429, in 42° 55′ 30″ N. lat., 50° 51′ W. lon., at a depth of 471 fathoms; from station 2530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; from station 2562, in 39° 15′ 30″ N. lat., 71° 25′ W. lon., at a depth of 1,434 fathoms; from station 2564, in 39° 22′ N. lat., 71° 23′ 30″ W. lon., at a depth of 1,390 fathoms; from station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms; from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., at a depth of 571 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2115, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., at a depth of 843 fathoms; from station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; from station 2552, in 39° 47′ 7″ N. lat., 70° 35′ W. lon., at a depth of 721 fathoms; from station 2533, in 40° 16′ 30″ N. lat., 67° 26′ 15″ W. lon., at a depth of 828 fathoms; from station 2531, in 40° 42′ N. lat., 66° 33′ W. lon., at a depth of 852 fathoms; from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; from station 2554, in 39° 48′ 30″ N. lat., 70° 40′ 30″ W. lon., at a depth of 445 fathoms; by the *Fish Hawk* from station 1029, in 39° 57′ 6″ N. lat., 69° 16′ W. lon., at a depth of 458 fathoms (Cat. No. 28947, U. S. N. M.); Cat. No. 26164, U. S. N. M., from station 893, in 39° 52′ 20″ N. lat., 70° 58′ W. lon., at a depth of 372 fathoms; Cat. No. 31865, U. S. N. M., from station 1155, in 39° 52′ N. lat., 70° 30′ W. lon., at a depth of 554 fathoms, and Cat. No.

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[1] It was at this time, on the deck of Capt. Collins' schooner, that the authors made the acquaintance of this most accomplished expert in the fisheries, who had never before had his attention called to the opportunities for investigation with which he was surrounded, and which he has since so fully utilised.

26220, U. S. N. M., from station 891, in 39° 46′ N. lat., 71° 10′ W. lon., at a depth of 480(?) fathoms. A single specimen, taken from the stomach of a *Chiasmodon niger*, was received from Gloucester in 1880.

ANTIMORA ROSTRATA, GÜNTHER.

Antimora rostrata, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 18; Challenger Report, XXII, 1887, 92, pl. XVI, fig. A.

This species is readily distinguished by the peculiarly produced snout, which forms a short, triangular, pointed lamina, sharply keeled on the sides, and overhanging the cleft of the mouth.

The head is rather short, broad posteriorly, half as long as the distance between ventral and anal fins. Eye round, rather large, its diameter one-fourth of the length of the head, less than that of the snout, and nearly equal to the width of the flat interorbital space. Mouth wide, the maxillary extending nearly to below the hind margin of the eye. Teeth in both jaws in narrow villiform bands; a small group of teeth on the vomer. Posterior extremity of the maxillary not much dilated. Nostrils close together; the posterior are wide, semicircular openings, the anterior narrower and round. The vent is rather nearer to the end of the operculum than to the root of the caudal.

The entire head (even the gill membrane and the foremost part of the snout) and the body are covered with small cycloid scales, of which only a few have been preserved; there are about 10 in a transverse line between the first dorsal fin and the lateral line and 140 in the lateral line.

The greater part of the dorsal and anal fins are covered with scales. The first dorsal is subcontinuous with the second, and the first ray is produced into a filament about as long as the head. The second dorsal and anal fins are rather low; the latter so much depressed in the middle as to present the appearance of a double anal. The free portion of the tail is narrow, terminating in a comparatively small caudal fin, which is truncated behind. Pectoral pointed, the upper rays being the longest; it is as long as or longer than the head exclusive of the snout. The two outer ventral rays prolonged as two filaments; the second being twice as long as the first, and not extending as far back as the pectoral.

Radial formula: D. 4, 51–56; A. 38–39; V. 6.

Color, black; the cavity of the mouth, gills and abdomen deep black.

This form occurs midway between the Cape of Good Hope and Kerguelen Island, and also east of the mouth of the Rio de la Plata. The *Challenger* obtained a specimen, 12½ inches long, at station 146, near Marion Island in 1,375 fathoms; and a specimen 24 inches long, at station 320, off Montevideo, in 600 fathoms.

HALARGYREUS, Günther.

Halargyreus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 342. (type, *H. Johnsonii*, Günther.)

Body elongate, covered with small scales (a separate caudal); 2 dorsal and 2 anal fins, the latter subcontinuous; ventrals composed of several rays. Jaws with a band of minute villiform teeth of equal size; no teeth on the vomer or palatine bones. No barbel. Branchiostegals 7. Pseudobranchiæ glandular, rudimentary, covered by the membrane; gill rakers of the outer branchial arch long. (*Günther.*)

HALARGYREUS BREVIPES, VAILLANT. (Fig. 325.)

Halargyreus brevipes, VAILLANT, Exp. Sci. Travailleur et Talisman, XXII, 1888, 295, pl. XXV, fig. 5.

A *Halargyreus* having (according to Vaillant), a general resemblance to *Merlucius smiridus*, body being nearly cylindrical anteriorly, and its thickness nearly equal to its greatest height, which is one-eighth of its length. The length of the head is one-fourth the length of the body, and its width is a little less than its height. Snout moderate, its length about one-third that of the head. Mouth rather large, although the maxillary does not extend beyond the vertical from the center of the orbit. Lower jaw slightly longer than the upper one. Jaws covered with fine teeth in bands; vomer and palatines toothless. Diameter of the eye one-fourth the length of the head; interorbital space much less, about two-elevenths of the length of the head. No barbel. Vent nearly median. Scales small, about 122 (as nearly as could be ascertained by Vaillant) in the lateral line; seven above and thirty below. The lateral line is near the dorsal outline.

First dorsal inserted behind the vertical from the base of the pectorals and short; the second placed close to the first, and extending almost to the base of the foremost rays of the caudal. First anal under the vertical from the fourteenth to the sixteenth ray of the second dorsal, terminating nearly under the tenth from the last ray of the same fin. The anal is deeply notched, its twenty-seventh ray being longer than any of the preceding ones, while the twenty-sixth is very short. The form of these two fins is best expressed by the accompanying illustration. Pectorals moderate, ventrals exceedingly short.

Radial formula: D. 8+56; A. 26+22; V. 5.

Color reddish-brown; silvery upon the cheeks and below. Pectorals dark. Mouth and branchial cavity intense black.

A single specimen was obtained by the French explorers at station XXI, off the coast of Morocco, at a depth of 1,319 meters. It was in very bad condition, and the description of Vaillant is confessedly imperfect.

No figure of the other species, *Halargyreus Johnsonii*, has ever been published. Vaillant distinguishes his species from that of Günther by the following characteristics: First, by the shape of the head, which in *H. brevipes* is broader than high, in *H. Johnsonii* higher than broad; by the longer maxillary in the latter, in which also the lower jaw does not pass the upper one; by the more advanced position of the dorsal in the latter, which begins in the vertical from the root of the pectorals; and also by the prolongation of the first ventral ray. The head of *H. Johnsonii* would appear, from the figure of Vaillant, to be shorter than that of *H. brevipes*.

It is very desirable that more material should be studied before two species of *Halargyreus* are fully accepted.

HALARGYREUS JOHNSONII, GÜNTHER.

Halargyreus Johnsonii, GÜNTHER, Cat. Fish. Brit. Mus., IV, 18, 342 (Madeira, from stomach of *Saccopharynx*); Challenger Report, XXII, 1887, 83.

Head rather elongate and compressed, its length being equal to the distance between the vent and the root of the ventrals; it is much higher than broad, its greatest height being more than one-half of its length. The snout is obtusely conical, a little longer than the diameter of the eye, which is one-fourth of the length of the head. Cleft of the mouth wide, the maxillary extending beyond the vertical from the middle of the eye. Upper jaw without lip, that of the lower very thin; the lower is received within the upper, both being equal in length anteriorly. A small bony tubercle, pointing obliquely forwards and downwards, occupies the lower part of the symphysis of the mandibles. The upper and lower jaws are armed with a narrow band of minute teeth of equal size. The interorbital space is flattish, and its width rather less than the vertical diameter of the orbit. Preoperculum rounded; operculum and suboperculum each terminating in a very small spine, both spines close together. The caudal fin is separated from the other vertical fins by a free peduncle.

Branchiostegals 7; gill openings very wide, the gill membranes scarcely united below the anterior third of the orbit; gills 4, a clift behind the fourth; the first branchial arch is provided anteriorly with long gill rakers, longer than the lamellæ of the gills.

The greatest depth of the trunk is equal to the distance between the anterior margin of the orbit and the end of the operculum. The anterior dorsal commences immediately behind the vertical from the root of the pectoral, and is composed of very slender, simple, and articulated rays, the anterior of which is the longest, half as long as the head. The second dorsal commences immediately behind the first, and is not much lower, its base being covered by a thin scaly membrane. The vent is situated in the vertical from the ninth ray of the second dorsal, and the anal commences immediately behind it. The fourth to seventh rays are the longest, the posterior decreasing in length to the seventeenth, after which four or five short rays follow, preceding the stronger rays of the second anal. Base of the pectorals narrow, its length being more than one-half of the length of the head; ventrals very narrow, with flat base, the outer ray being produced into a very fine filament of moderate length. The scales extend forward on the snout.

Radial formula: D. 7+47—57; A. 41—46.

The color appears to have been a delicate red on silvery ground; pectoral and anal transparent. Mouth and gill cavity black. (*Günther.*)

	Inches.	Lines.
Distance of the end of the snout from the extremity of the operculum	2	5
Distance of the end of the snout from the origin of the first dorsal	2	8
Distance of the end of the snout from the origin of the second dorsal	3	6
Distance of the end of the snout from the vent	4	4
Distance of the end of the snout from the origin of the second anal	6	8

This species, of which a figure has never been published, was first described by Dr. Günther from a specimen collected by J. T. Johnson, at Madeira, from the stomach of a *Saccopharynx.* He informs us that several specimens have since been sent to the British Museum from New Zealand, where it is at times abundant.

ERETMOPHORUS, Giglioli.

Eretmophorus, GIGLIOLI, Proc. Zool. Soc., London, 1889, 328 (type, *E. Kleinenbergii*, *loc. cit.*, Pl. XXXIV.)

A genus of *Gadoidea* having two dorsal fins and one anal, with 5 elongate, exserted, ventral rays, the median ones with lanceolate tips; a large abdominal cone.

ERETMOPHORUS KLEINENBERGI, GIGLIOLI.

Eretmophorus Kleinenbergii, GIGLIOLI, Proc. Zool. Soc., London, 1889, 328, Pl. XXXIV.

Body compressed, tapering toward the tail, but less so in the younger specimen, in which the huge and singular abdominal cone is also less developed. The height of the body behind the abdominal cone is contained between 5½ and 6 times in the total length exclusive of the caudal fin. The lateral line extends nearly in a straight line from the branchial cleft to the end of the root of the tail; it is merely marked as a furrow with indistinct pits along its course; in the larger specimen at its cephalic end two slight furrows run parallel with it above and beneath. The head is moderate, rather large; its length is contained about 5 times in the total exclusive of the caudal fin; the snout is short, nearly equal to the transverse diameter of the eye; its anterior contour is rounded; there is a slight median gibbosity in front over the mouth. This is moderate, its aperture hardly reaching the vertical from the anterior margin of the eye. Nostrils in front and a little above the eye, the posterior aperture largest and oval. Eye moderate; behind it, and extending toward the nape and downwards along the preoperculum, are two series of conspicuous pores. The space between the eyes is nearly flat and rather broader than the diameter of the eye; behind, the nape rises convex, presenting a median furrow in front of the first dorsal in the older specimen. On the nape in the larger specimen are a number of very distinct hyaline cylindrical warts, just like those of *Bellottia* except in shape; the latter have been described by Prof. Emery[1] and are nearly hemispherical. In *Eretmophorus* they begin just behind the interocular space and appear to form a double series; in the older specimen I counted eight, but a few more extend toward the head of the lateral line; they are evidently sense-organs allied to those of the lateral line. In concluding I I must state that these warts are not to be seen on the two younger specimens, in which they appear to be represented by pores, more numerous and more distinct than in the older and larger specimen.

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[1] C. Emery, "Contribuzioni all' Ittiologia," in Mittheil. a. d. Zool. Station zu Neapel, VI, p. 157 tav. 10, ff. 18, 19. Naples, 1885.

The gill-openings are rather wide, the branchiostegal membranes are largely developed, with robust rays; the opercular bones are smooth and very thin; the branchial cavities contain four complete arches. The specimens are so very fragile that I did not dare to pursue my investigations further.

The fins are those of an Anacanthine fish, but I could not see any transverse articulations in the first ray of the first dorsal; they are not very distinct on the other median fins except on the caudal, the only fin with slightly bifid rays; in the other fins the rays are simple; at the base of the long dorsal and anal fins the projecting heads of the interspinous bones give rise to a serrated appearance. The first dorsal is small, but quite detached from the second one in the two larger specimens; it rises just above the insertion of the pectorals; its second ray is the longest and equals in height the commencement of the second dorsal fin. This is greatly developed and maintains a nearly equal line throughout, but as the body tapers toward the tail the fin increases in height in equal ratio. In size, shape, and development the anal is the exact counterpart of the second dorsal fin. The caudal fin is quite distinct, its contour is lanceolate in the smaller specimen, nearly oval in the older one, subtruncate with rounded edges in the oldest or biggest specimen. The pectorals are distinctly lobate, which character is more marked in the smaller specimens; they are of moderate size and broadly oval in contour. The ventrals certainly give the most striking feature to this singular fish; they are inserted below and in front of the pectorals, at the base, and on each side of the great abdominal cone. They are of great size, and the very robust rays, 5 in number, are all elongated and considerably exceed the intervening membrane, which only unites their basal portions; the internal and external rays are considerably less developed than the three median ones, the internal one is the shortest; both are simple and without any trace of terminal dilatations. The three median rays all terminate in a large beautiful lanceolate leaf-like blade, through which, however, the ray continues to the pointed extremity; they are all prolonged beyond the two first-mentioned rays, but the outer one is considerably shorter than the other two; it is smooth and its terminal blade is smaller. The third and fourth rays, counting from the outer one, are subequal, and bent backwards extend very nearly to the root of the tail; at about the basal third of their length they both present a singular angular dilatation, which looks like a thickened articulation, but which is merely, so far as I can make out, a membranous dilatation. The great lanceolate terminal blades are very large, being little less than one-fourth of the total length of the ray which supports them; their edges are sinuous and they terminate in a fine point. Judging from their length, strength, and development, these ventral paddles must be most efficient for swimming; I know of no other fish possessing anything like them, and have, therefore, thought proper to derive from so peculiar a character the generic name which I have proposed for this singular fish.

The next remarkable feature of my *Eretmophorus* is the huge abdominal cone, the base of which occupies the entire space between the insertions of the ventrals and that of the anal fin. This cone appears to develop with age, and it is certainly larger and more prominent in my oldest and biggest specimen, equaling in height that of the body just behind the pectorals, where it is greatest. This abdominal cone is quite smooth; its skin, devoid of scales, is silvery. I have not ventured to open it in any of the three specimens yet discovered, for fear of damaging to a certainty these rare and very delicate creatures; but the supposition that it contains most of the alimentary canal can not be far from the truth; at its apex, which becomes cylindrical, is an aperture, evidently the vent, and behind this a slender conical papilla on which I could not distinguish anything like an opening.

The scales cover the whole body except the head and abdominal cone, which are, as I have said before, naked. They are small, very adherent, cycloid, and marked with concentric lines. I have figured a few magnified (pl. XXXIV, fig. 1), to give an exact idea of their characters; they are very similar to those of *Hypsirhynchus hepaticus*, Facciolà. A thin pellucid epidermal layer covers them.

Only three specimens of *Eretmophorus Kleinenbergi* have, so far as I know, yet been captured and preserved; they were caught alive with a hand-net along with other pelagic animals on the surface at the mouth of the harbor of Messina as the current was flowing in.

I owe them to the kindness of my friend, Prof. Nicolaus Kleinenberg, director of the Zoölogical Institute of the Messina University, to whom I owe many other ichthyological rarities; and as a mark of my gratitude and esteem I have thought proper to give his name to so singular a species, which is evidently as yet undescribed. These specimens are now in the central collection of Italian vertebrata in the Royal Zoölogical Museum at Florence. As they present differences in size and in other respects, I shall proceed to describe them briefly.

My smallest specimen (pl. XXXIV, fig. 2) measures 28½ millimeters in total length; it was caught on the 10th of May, 1887. It is evidently much younger than the other two; the two dorsals are yet united and the larval median fin extends as a crest to the head. The caudal is, however, quite distinct and remarkable for its lanceolate form. The abdominal cone is comparatively smaller than in the two older specimens, and a membrane unites its hinder portion to the anal fin. The lobe of the pectorals is very distinct, and the rays look thickened at their distal ends. The ventrals have the characteristic form and development. The color of the body is yellowish white (in alcohol); 8 very distinct broad black bands cross the body transversely, being slightly oblique: the first occupies the base of the abdominal cone, the last the root of the tail; the fourth, fifth, sixth, and seventh are continued as a black blotch on the base of the anal fin; the ventral paddles are tipped and edged with black; the ray is, however, white; otherwise the fins are colorless. Looking with a lens, these black bands and blotches result in an accumulation of dark points or chromatophores; this is the case also in the other specimens.

The second specimen, according to size and age, measures 68 millimeters in total length; it is figured slightly enlarged (pl. XXXIV, fig. 3). It was captured alive near the surface in the harbor of Messina on the 2d of June, 1888. It bears considerable resemblance to the first specimen described, but has lost some of the larval characters above noted; all the median fins are well distinct; the caudal has an oval contour, but the abdominal cone, covered with a slightly silvery skin, shows still a posterior membranous fringe which partially unites it with the anal fin. The pores on the head and nape are very distinct. In color this specimen is also very similar to the first one; the black transverse bands are very well marked, but they are slightly fainter and the first one does not extend to the abdominal cone, which is well developed. Ten very distinct black blotches extend along the base of the anal fin and three along the caudal end of the second dorsal; three additional blotches are on the back between the third and fourth, fifth and sixth, and sixth and seventh transverse bands.

The third specimen has the aspect of an adult. It was caught also near the surface at the entrance to the harbor of Messina at the end of April, 1884. It measures 78 millimeters in total length; head, 16 millimeters; from nape to apex of abdominal cone, 27 millimeters; height of body immediately behind the abdominal cone, 12 millimeters. I have figured it once and a half the natural size (Pl. XXXIV, Fig. 4). It differs especially in color from the two younger and smaller specimens; the transverse dark bands on the body and blotches along the median fins are faintly marked. The paddles of the ventral fins are tipped with blackish brown, and were edged with violet in the fresh specimen, the general color of which was a faint pink, with yellowish tinge along the basal half of the dorsal and anal fins. The abdominal cone is bright silvery; it has no trace of a hind marginal membrane. The caudal is subtruncate; and, lastly, the cylindrical hyaline warts on the nape are very prominent and distinct. (*Giglioli.*)

HYPSIRHYNCHUS, Facciola.

Hypsirhynchus, FACCIOLÀ, Naturalista Siciliano, III, pl. II.

A genus of *Gadoidea* related to *Eretmophorus*, but having seven ventral rays, slightly prolonged, and with rounded, rather than lanceolate, tips. No abdominal cone.

HYPSIRHYNCHUS HEPATICUS, FACCIOLÀ.

Hypsirhynchus hepaticus, FACCIOLÀ, *loc. cit.*

This species was obtained at Messina by Dr. L. Facciolà, and is also represented by a Naples specimen in the Florence Museum. It has not been fully described, nor have we seen even the partial description in the *Naturalista Siciliano.*

STRINSIA, Rafinesque. (Figure 326.)

Strinsia, RAFINESQUE, Indice d' Ittiologia Siciliana, 1880, 51.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 344.

This genus was briefly characterized by Rafinesque in the following terms:

"Gen. *Strinsia.* Due ale dorsali, una ala anale riunita all' ala caudale."

Günther's fuller diagnosis would appear to have been drawn from a study of the description and figure in the "Iconografia" of Prince Bonaparte, who seems to have had a sight of Rafinesque's type.

Strinsia is known only from this one specimen, carelessly described, and probably carelessly preserved nearly a century ago. The careful work of later Italian and French explorers has not brought the form again to notice. Conservative and careful writers like Giglioli, who has systematically reviewed all of Rafinesque's collecting fields about Sicily, are beginning to omit it from their faunal lists. Something must be wrong.

What, then, is *Strinsia*, or rather, what was it? This is a question which we shall not attempt to answer, except by a suggestion. May not Rafinesque's type have been a fish belonging to some closely related genus, whose tail had been deformed or partially restored after mutilations; or, indeed, may not Bonaparte's figure, as well as Rafinesque's diagnosis, have been drawn from a badly preserved specimen, with the caudal rays and those of the posterior parts of the dorsal and anal frayed out and imperfect?

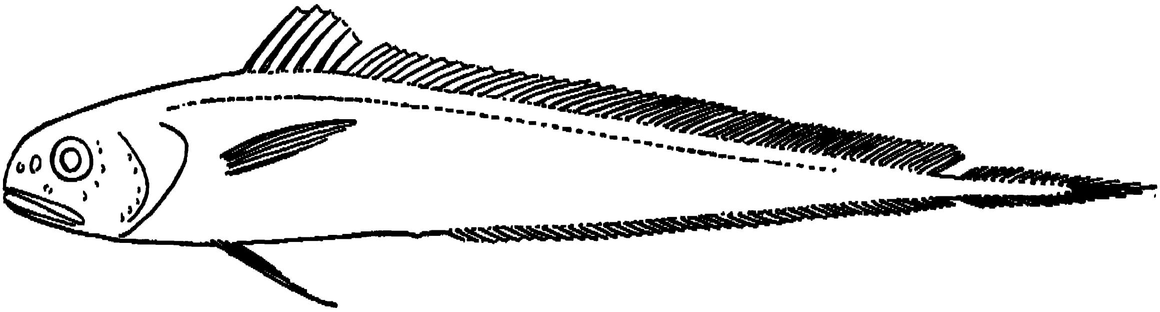
The tail of Bonaparte's figure does not look natural. The figure, except for the tail, answers very well to the description of *Halargyreus.*

The only species named under *Strinsia* is *S. tinca*, Rafinesque (*op. cit.*, 12, 52).

MELANONUS, Günther.

Melanonus, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 19.—Challenger Report, XXII, 1887, 83, Fig. (*M. gracilis*) pl. XIV, fig. 13.

This genus is represented by one species, obtained by the *Challenger* in the Antarctic Ocean, at 1,975 fathoms, and thus characterized:



MELANONUS GRACILIS.

Head and body rather compressed, covered with cycloid scales of moderate size, and terminating in a long, tapering tail. Eye of moderate size; mouth wide, anterior and lateral; both jaws with narrow bands of villiform teeth; vomer and palatines with very narrow bands of minute teeth. Barbel none. Dorsal fin with a short anterior and a posterior division; the middle portion commences immediately behind the anterior, and has the anterior rays well developed; the posterior division is confluent with the extreme caudal rays and the posterior anal division. Anal like the dorsal, minus its anterior division. The outer gill rakers of the first branchial arch strong and long, longer than the gill laminæ.

Ventrals composed of several rays, slightly in advance of the pectorals, which are narrow. Bones flexible; mucous cavities of the head of moderate capacity. Pseudobranchiæ none. (*Günther.*)

ONOS, Risso.

Onos, RISSO, Hist. Nat. Eur. Mérid., 1826, III, 214 (type, *G. mustella* L.).—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 240.—JORDAN & GILBERT, Bull., XVI, U. S. Nat. Mus., 796.—COLLETT, Vid. Selsk. Forhandl., Christiania, 1891, No. 11.

Motella, CUVIER, Règne Animal, ed. 2, II, 1829, 334.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 364.

Molvella and *Motella*, KAUP, Wiegm. Archiv., 1859, 90.

Gadoids with body rather elongate, covered with minute scales; head not compressed; upper jaw longer; snout with 2 barbels and chin with 1; teeth on jaws and vomer in bands; palatines toothless; dorsal fins 2, the anterior composed of small fringe-like rays concealed in a groove, preceded by a single long ray; second dorsal and anal long and similar; caudal rounded or lanceolate; tail isocercal; ventral fins with from 5 to 7 rays; chin with a barbel.

KEY TO THE SPECIES OF ONOS.

[From Collett.]

- I. First ray of first dorsal short (equal to or slightly longer than snout).
  - A. Pectoral rays about 14 .... [O. PACIFICUS]
    - 1. Pectoral rays about 17.
      - *a.* Longitudinal diameter of eyes equal to or less than width of interorbital space.
        - * Height of body 7⅓ in total length, v. 6 .... O. MEDITERRANEUS
        - **Height of body 6⅔ in total length, v. 7 .... O. GUTTATUS
      - *b.* Longitudinal diameter of eyes greater than width of interorbital space.
        - * Head large, its length about 4⅓ in total .... [O. MACROPTHALMUS]
        - **Head small, its length about 5⅓ in total .... O. BISCAYENSIS
    - 2. Pectoral rays 22 or more.
      - *a.* Longitudinal diameter of eye equal to or less than interorbital space.
        - First ray of first dorsal equal to diameter of eye .... O. VULGARIS
        - First ray of first dorsal greater than diameter of eye .... O. REINHARDTII
      - *b.* Longitudinal diameter of eye great, larger than interorbital space .... O. CARPENTERII
- II. First ray of first dorsal long (equal to head), color uniform salmon or brick red .... O. ENSIS.

ONOS ENSIS, (REINHARDT), GILL. (Figure 327.)

Motella ensis, REINHARDT, Kon. Ved. Selsk. Math. Natura, Copenhagen, VI, 1837; ex. VII, 1838; 116, 128.—COLLETT, Forh. Vid. Selsk. Christiania, 1878, No. 17; Norske Nordhavs Exp., 1890, Fish, 134.—LÜTKEN, Vid. Medd. Naturh. Foren. Copenhagen, 1881, 236.

Onos ensis, GILL, Proc. Acad. Nat. Sci., Phila. 1863, 241.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus. 797.—GÜNTHER, Challenger Report, XXII, 98.—COLLETT, Forh. Vid. Selsk, 1891, No. 11.

Onos rufus, GILL, Proc. U. S. Nat. Mus., VI, 1883, 259.—JORDAN, Cat. Fish. N. A., 128.

Head small, its length 5¾–6 in total. Eye small, its diameter one-half the length of the snout. Vent nearly median. First dorsal rays prolonged, as long as head. Teeth in villiform bands, small and uniform.

Radial formula: D. 59; A. 44–46; P. 22–27; V. 8.

This form is known from Greenland, whence the museum at Copenhagen obtained 2 specimens, taken in 1836 from the stomach of a seal (*Cystophora*) at Omenak (lat. 70° N). Another was found in 1882 by the U. S. Fish Commission steamer *Fish Hawk* in lat. 40°, off the coast of New Jersey, in 1,106 fathoms.

The body is unusually high, the greatest height at anus contained 4½ times in length exclusive of caudal. The head enters 5⅓ times in the length to end of caudal peduncle and 6 times in total length; its width at cheeks equals two-thirds of the head's length.

The eyes are rather large, nearly as long as snout and the interorbital area, and are entirely in the anterior half of head, the posterior margin of the orbit nearly equidistant between the tip of the snout and the posterior margin of the operculum. The mouth is normal; the supramaxillary ends under the posterior margin of the pupil. The teeth are in a narrow band in both jaws and some of those at least in the outer row of upper jaw are slightly enlarged and brownish colored. The teeth of the vomer form a short curved band in two rows. The nasal barbel about equals the diameter of the eye. The chin barbel is small and does not much exceed one-half the diameter of the eye.

The foremost ray of the first dorsal springs from the back above opercular margin. The second dorsal fin is low in front but rises rapidly to the seventh or eighth rays behind which it is nearly uniform for a long distance and the highest at posterior portion.

The anal fin is much lower than the second dorsal. The caudal is slightly emarginate, almost truncate behind, and its median rays are about two-thirds as long as the head.

The pectorals are nearly three-fourths as long as head and are produced toward the upper angles, the third ray being longest.

The ventral fins have their basis mostly in advance of the pectorals, and the longest ray is filamentous and nearly equals the pectoral.

The lateral line is obsolescent.

The *Albatross* obtained specimens of this species from the following localities: Cat. No. 33430, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 35600, U. S. N. M., from station 2206, in 39° 35′ N. lat., 71° 24′ 30″ W. lon., at a depth of 1,043 fathoms; Cat. No. 33297, U. S. N. M., from station 2051, in 39° 41′ N. lat., 69° 20′ W. lon., at a depth of 1,106 fathoms, and from station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms.

ONOS MACROPHTHALMUS, GÜNTHER.

Motella macropthalma, GÜNTHER, Ann. and Mag. Nat. Hist., 1867, xx, 280, pl. v., fig. B.
Onus macrophthalmus, GÜNTHER, Challenger Report, XXII, 96.—COLLETT, Bull. Soc. Zoöl. France, XV, 1890, 108; Vid. Selsk. Forhandl., 1891, No. 11.

"Barbels, three. The length of the head is one-fourth of the total (without caudal). The diameter of the eye is one-fourth of the length of the head, as long as the snout, and much longer than the interorbital space is wide. The maxillary reaches the hind margin of the orbit. Both jaws with teeth unequal in size, some being enlarged and canine-like. Vent nearer to the snout than to the end of the anal. The anterior ray of the first dorsal about as long as the eye."

Radial formula: D. 55; A. 55; P. 17; V. 5. Back with narrow brownish crossbars.

This species is known only from a single example, 3 inches long, obtained in 80 or 90 fathoms, near the Hebrides. Dr. Lütken gives it as his opinion that this represents the young of *Motella mediterranea*, but this view is disproved essentially by Collett.

ONOS BISCAYENSIS, COLLETT.

Onus biscayensis, COLLETT, Bull. Soc. Zoöl. France, XV, 1890, 107.—Vid. Selsk. Forhandl., Christiania, 1891, No. 11.

Body elongate, its height 9 times or a little more in its length; head small, 5½ in total, 4¾ in total without caudal. Height of caudal peduncle 4 times in length of head. Eye large, its diameter 3¾ in length of head, exceeding in length the width of the interorbital space, the length of the snout, and that of the first dorsal. Barbels, 3 (two nasal, one mandibular).

Vent nearer to the tip of the snout than to the extremity of the anal by a space equal to the length of the snout.

Base of first dorsal twice in length of head and a little longer than distance of its origin from snout. Pectoral reaches nearly to origin of second dorsal.

Intermaxillary teeth in bands, a single prominent canine on each side.

Color, brownish; second dorsal and caudal with brown bands.

Radial formula: D. 54; A. 44; P. 17; B. 6.

Two young specimens (133 millimeters) were taken by the *Hirondelle*, one in the gulf of Gascony at a depth of 77 fathoms, the other off Cape Finisterre in 200 fathoms. This species resembles most closely *O. macrophthalmus*, but has a smaller head, and differs in color and dentition.

ONOS REINHARDTII, (KROYER), COLLETT.

Motella argentata, REINHARDT, Kgl. D. Vid. Selsk. Math. Nat. Copenhagen, 1837, CX.

Motella Reinhardti, KRÖYER, MS. of about 1852.—COLLETT, Forhandl. Vidensk. Selsk. Christ., 1878, 83. —LÜTKEN, Vid. Meddel. nat. Foren. Kjøbenhavn, 1882, 230.

Onus Reinhardti, COLLETT, Norsk. Nordh. Exped., Fisk., p. 131, pl. IV. fig. 34; Vid. Selsk. Forh., 1891, No. 11, Christiania.—GÜNTHER, Challenger Report, XXII, v. 97, pl. XIX, fig. B.

Barbels, 3. The length of the head is contained 4¼ times in the total (without caudal), the diameter of the eye 4⅔ or 5 times in the length of the head; it is shorter than the snout, equal to, or less in length than the interorbital space. The maxillary scarcely extends to the hind margin of the eye. Both jaws and the vomer with an outer series of larger teeth. Vent nearer to the root of the caudal than to the snout. The anterior ray of the first dorsal fin rather longer than the eye.

Radial formula: D. 53–59; A. 43–48; P. 22–24; V. 8. Coloration uniform. (*Günther.*)

Several specimens were obtained in the Faröe Channel by the *Knight Errant* in 540, 608, and 640 fathoms, and by the North Atlantic expedition in the open sea west of Bear Island at a depth of 658 fathoms. Other specimens are known from Greenland.

ONOS CARPENTERI, GÜNTHER.

Motella macrophthalma, GÜNTHER, Ann. and Mag. Nat. Hist., 1874, XIII, 139 (not 1867).

Onus Carpenteri, GÜNTHER, Challenger Report, XXII, 87, pl. XLII, D.—COLLETT, Vid. Selsk. Forhandl., Christiania, 1891, No. 11.

Barbels, 3. The length of the head is two-ninths of the total (without caudal); the diameter of the eye two-ninths of the length of the head, as long as the snout, and longer than interorbital space is wide. The maxillary reaches to a little behind the hind margin of the orbit. Both jaws with teeth unequal in size, some being enlarged and canine-like. Vent much nearer to the snout than to the end of the anal. The anterior ray of the first dorsal fin about as long as the eye.

Radial formula: D. 49; A. 45; P. 23; V. 6. Coloration uniform. (*Günther.*)

One specimen only is known, 4½ inches long, obtained during the cruise of H. M. S. *Porcupine*, in 180 fathoms, between Shetland and Faröe. Collett writes that he formerly regarded this specimen as representing a more advanced stage of growth of *Onos macrophthalmus.*

ONOS TRICIRRATUS, (BLOCH), GOODE AND BEAN.

Gadus tricirratus, BLOCH, Ichthyologie, pl. CLXV.

Motella tricirrata, NILSSON, Prod. 48; Skand. Fauna, IV, 586.—VAILLANT, Travailleur et Talisman, 1888, 285.

Snout obtuse, broad, rather depressed, with 3 barbels, one at each of the anterior nostrils, the third at the chin. Teeth villiform and of equal size in the upper jaw. A series of white dots along the lateral line (generally). (*Günther.*)

The "Three-bearded rockling," which occurs along the coast of Europe from Scandinavia to the Mediterranean, was found by the *Talisman* off Soudan at the depth of 640 meters (station LXXI), as well as by the *Travailleur* along the coast of Morocco at 112 meters (station XXXIV).

RHINONEMUS, Gill.

Rhinonemus, GILL, Proc. U. S. Nat. Mus., 1863, 230.—JORDAN and GILBERT, Bull., XV, U. S. Nat. Mus., 737.

Onine gadoids having a barbel at the snout as well as one at each nostril and one at the chin. Head high anteriorly and compressed. No large canines.

RHINONEMUS CIMBRIUS, (LINNÆUS), GOODE and BEAN. (Figure 328.)

Gadus cimbrius, LINNÆUS, Syst. Nat., ed. XII, 1766, 440.—LACÉPÈDE, Hist. Nat. Poiss., II, 1801, 442.

Motella cimbria, BELL, Canadian Naturalist and Geologist, IV, 1859, 209.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 367.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 241.

Onos (*Rhinonemus*) *cimbrius*, GOODE and BEAN, Proc. U. S. Nat. Mus., I, 1878, 349 (with full synonymy); Cat. Fish. Essex Co. and Mass. Bay, 1879, 8.

Enchelyopus cimbrius, JORDAN, MS., in GOODE, Proc. U. S. Nat. Mus., III, 476.

Enchelyopus cimbricus, SCHNEIDER, Bloch's Systema Ichthyologiæ, 1801, 50, pl. IX.

Motella cimbrica, NILSSON, Prodr. Ichth. Scand., 48; Skand. Fauna, IV, 1855, 587.—YARRELL, Hist. Brit. Fishes, 2d ed., 1841, II, 274.

Motella caudacuta, STORER, Proc. Bost. Soc. Nat. Hist., III, 1848, 5; Mem. Amer. Acad. Sci., 1867, 411; Hist. Fishes Mass., 1867, 183.

Rhinonemus caudacuta, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 241; Cat. Fishes E. Coast N. Am., 1873, 18.—GOODE and BEAN, Am. Journ. Sci. and Arts, XIV, Dec., 1877, 476.

Head oblong, compressed; the snout high, its anterior profile blunt; mouth large, inferior; a barbel at chin, one at end of snout, and one on each anterior nostril; maxillary reaching much beyond eye. Teeth in narrow bands, some of them considerably enlarged. Lateral line stitch-like, developed at intervals. First (free) ray of dorsal as long as head; ventrals about half length of head; caudal somewhat acute.

Radial formula: D. 50; A. 43; V. 5.

Color brownish; posterior part of dorsal and anal and lower margin of caudal abruptly black; inside of mouth black.

This species is a resident of the deep waters of Massachusetts Bay, and has frequently been found outside the 100-fathom curve at the bottom. Its young swim at the surface in the latter part of summer and fall, and have hitherto been identified with the little Mackerel Midge, *Ciliata argentata*. We have examined numerous specimens which purported to be *Ciliata*, and have found them in every case to be the young of this species. English ichthyologists, indeed, record *Ciliata* as the larval form of *Motella*, and if this be not the case we doubt if the genus *Ciliata* has ever been observed in the Western Atlantic.

A single specimen of *Rhinonemus*, apparently *R. cimbrius*, was taken by the *Blake* at station CCCXXVII, in 34° 00′ 30″ N. lat., 76° 10′ 30″ W. lon., at a depth of 178 fathoms. The specimen was in poor condition.

The *Albatross* obtained examples from the following localities: Cat. No. 35680, U. S. N. M., from station 2240, in 40° 27′ 30″ N. lat., 70° 29′ W. lon., at a depth of 44 fathoms; Cat. No. 35681, U. S. N. M., from station 2241, in 40° 21′ N. lat., 70° 29′ 15″ W. lon., at a depth of 50 fathoms; Cat. No. 35682, U. S. N. M., from station 2239, in 40° 38′ N. lat., 70° 29′ 45″ W. lon., at a depth of 32 fathoms; from station 2426, in 36° 01′ 30″ N. lat., 74° 47′ 30″ W. lon., at a depth of 93 fathoms; from station 2513, in 43° 34′ N. lat., 63° 56′ 30″ W. lon., at a depth of 134 fathoms; from station 2505, in 44° 23′ 30″ N. lat., 60° 44′ 15″ W. lon., at a depth of 93 fathoms; from station 2545, in 40° 01′ N. lat., 70° 23′ 45″ W. lon., at a depth of 142 fathoms; from station 2559, in 39° 48′ N. lat., 71° 48′ 30″ W. lon., at a depth of 120 fathoms; from station 2506, in 44° 26′ N. lat., 62° 10′ W. lon., at a depth of 127 fathoms; and from station 2299, in 35° 40′ N. lat., 74° 51′ 30″ W. lon., at a depth of 296 fathoms.

The *Fish Hawk* obtained specimens, Cat. No. 28862, U. S. N. M., from station 953, in 39° 52′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 724 fathoms; Cat. No. 28917, U. S. N. M., from station 998, in 39° 43′ N. lat., 71° 32′ W. lon., at a depth of 302 fathoms; Cat. No. 28843, U. S. N. M., from station 951, in 39° 57′ N. lat., 70° 31′ 30″ W. lon., at a depth of 225 fathoms; Cat. No. 28890, U. S. N. M., from station 993, in 40° 28′ N. lat., 70° 44′ W. lon., at a depth of 39 fathoms; Cat. No. 26107, U. S. N. M., from station 877, in 39° 56′ N. lat., 70° 54′ 18″ W. lon., at a depth of 126 fathoms; Cat. No. 31878, U. S. N. M., from station 1153, in 39° 34′ N. lat., 70° 37′ W. lon., at a depth of 225 fathoms; Cat. No. 28815, U. S. N. M., from station 946, in 39° 55′ 30″ N. lat., 71° 14′ W. lon., at a depth of 247 fathoms; Cat. No. 33351, U. S. N. M., from station 1161, in 40° 28′ N. lat., 70° 37′ W. lon., at a depth of 45 fathoms; Cat. No. 33353, U. S. N. M., from station 1162, in 40° 32′ N. lat., 70° 39′ W. lon., at a depth of 45 fathoms; Cat. No. 33362, U. S. N. M., from station 1160, in 40° 24′ N. lat., 70° 35′ W. lon., at a depth of 41 fathoms; Cat. 33352, U. S. N. M., from station 1159, in 40° 20′ N. lat., 70° 35′ W. lon., at a depth of 55 fathoms; Cat. No. 28994, U. S. N. M., from station 1043, in 38° 39′ N. lat., 73° 11′ W. lon., at a depth of 130 fathoms; Cat. No. 28760, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; Cat. No. 28823, U. S. N. M., from station 948, in Buzzards Bay, Penikese Island, at a depth of 7 fathoms; and Cat. No. 25857, U. S. N. M., from station 802, in Narragansett Bay, at a depth of 12½ fathoms. The *Bluelight* captured three young individuals at stations 163 and 156, in Blue Light Cove, at a depth of 2 fathoms, and station 182, in 15 to 23 fathoms.

BROSMIUS, Cuvier.

Brosmius, CUVIER, Règne Animal, ed. 2, 1827, III, 334 (type, *Gadus brosme*, Müller).—GÜNTHER, Cat. Fish. Brit. Mus., IV, 369.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 241.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 802.

Gadoids having the body moderately elongate and a single dorsal fin, and a separate caudal. Mouth moderately large. Teeth on jaws, vomer, and palatines; some of those on the vomer and palatines enlarged; chin with a barbel; scales very small; branchiostegals 7. Ventral fins several rayed.

BROSMIUS BROSME, (MÜLLER), GÜNTHER. (Figure 329.)

Gadus brosme, MÜLLER, Prodromus Zoologiæ Danicæ, 41.

Brosmius brosme, GÜNTHER, Cat Fish. Brit. Mus., IV, 1862, 369; Proc. Royal Soc. Edinburgh, 1882, 680.—GOODE and BEAN, Bull. Essex Inst.—LILLJEBORG, Sverige och Norg. Fiske, II, 202.

Brosmius flavescens, Hist. STORER, Fish Mass., 1867, 190. (A deformed specimen?)

Head flattened above; its length 4½ times in that of body; upper jaw slightly longer than lower; mouth large, oblique; maxillary reaching beyond orbit. Height of body 5½ times in its length.

Radial formula: D. 98; A. 71.

Color, brownish, mottled; young uniform dark slate-color or with transverse yellow bands; vertical fins bordered with blackish, and with a white edge.

The Cusk or Torsk lives on the offshore banks of northern New England. In Europe, according to Günther, its range is from 30 to 120 fathoms, and an adult was obtained by the *Knight Errant*, in 1880, in the Faröe channel, at the depth of 530 fathoms. On the New England coast it is a common resident of the inshore fishing grounds, where it occurs in great abundance, lurking among the stones, but is soon caught up by the fishermen after the discovery of a new bank. It occurs as far out as the 250 or 300 fathoms line.

BROSMICULUS, Vaillant.

Brosmiculus, VAILLANT, Exp. Sci. Tavailleur et Talisman, Poissons, 1888, 292 (type, *Brosmiculus imberbis*, Vaillant).

A gadoid, with elongated body, a single dorsal and anal; caudal distinct; ventrals slender, 5-rayed. Teeth moderate, biserial in the jaws, none on the vomerines or palatines. No barbel. No pseudobranchiæ.

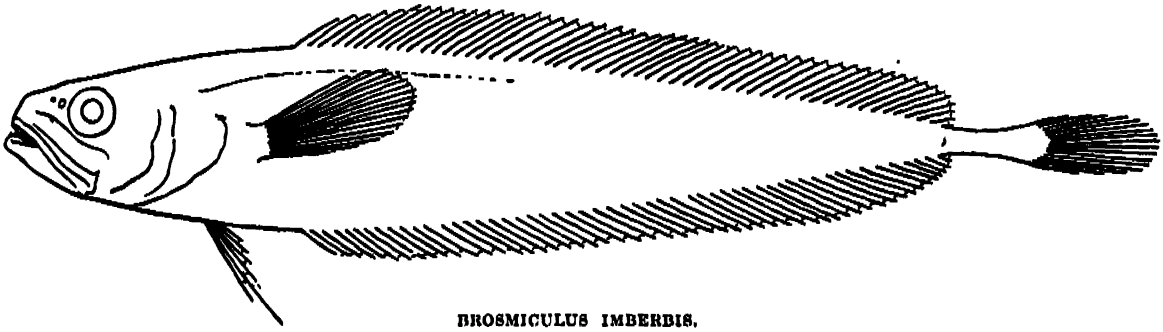
This form is said by Vaillant to be near to *Brosmius*.

BROSMICULUS IMBERBIS, VAILLANT.

Brosmiculus imberbis, VAILLANT, Exp. Sci. Travailleur et Talisman, Poiss., 1888, 293.

A *Brosmiculus* having its body elongate, slender, its height one-fourth of its length. Its head is twice as long as the height of the body, a little higher than broad, with an obtuse, truncated muzzle, whose length is one-fourth that of the head. Mouth moderate, the maxillary reaching to the vertical from the center of the eye; the lower jaw slightly the longer. Teeth in both jaws small, conical, in 2 rows; vomer and palatine without teeth. Diameter of the eye one-fourth the length of the head; interorbital space three-tenths. No barbel. Scales simple, 81 in the lateral line, 7 above and 23 below it. Head completely scaly to the very extremity of the snout.

Insertion of the dorsal fin behind the vertical from the base of the pectoral, and terminating a slight distance from the caudal. The anal begins almost in the same vertical, and is almost equal in length. Caudal rounded; caudal peduncle slender, somewhat elongate. Pectorals placed rather high, their length less than that of the head. Ventrals jugular, shorter than the pectorals, with slender base; second ray elongate and extending beyond the origin of the anal.



BROSMICULUS IMBERBIS.

Radial formula: D. 58; A. 58; V. 5.

Color dull gray; light behind the head, posterior part of the back, and caudal peduncle. Cheeks silvery. Vertical fins deep brown; pectorals and ventrals blackish.

Two specimens were obtained by the French explorers at station CX, off the Cape Verde Islands, at a depth of 460 meters.

Family MERLUCIIDÆ.

Merluciidæ, ADAMS, Manual Nat. Hist., 1864, 104.—GILL, Arr. Fam. Fish., 1872, 3. (No. 25); Century Dictionary, 3719; Proc. Acad. Nat. Sci. Phila., 1884, 172.

A family of *Gadoidea*, having the caudal region moderate and coniform behind. Caudal rays procurrent forward. Vent submedian. Frontal bones paired and excavated, with divergent crests, continuous from the forked occipital crest. No barbels. Suborbital bones moderate. Mouth terminal. Dorsal fin double, divided into a short anterior and a long posterior portion; anal fin corresponding in shape and position to the second dorsal. Vertebræ peculiarly modified, with well-developed and closely packed neural spines. Ventrals subjugular. Ribs wide, approximated and channeled below, or with inflated sides.

MERLUCIUS, Rafinesque.

Merluccius, RAFINESQUE, Caratteri di alcuni nuovi generi, etc., 1810, 26 (type *Merluccius smiridus*=*Gadus merluccius*, L.).—GÜNTHER, Cat. Fish. Brit. Mus., IV, 344.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 808.

Stomodon, MITCHILL, Rep. Fish. N. Y., 7.

Body elongate, covered with small deciduous scales. Head conical. Snout long, depressed. Mouth large, oblique; maxillaries extending to opposite the eyes; lower jaw longest. Teeth slender, in about 2 series on jaws, those of the inner row longer and movable; vomer with five teeth; palatines toothless. Eye rather large; edge of preopercle free; preopercle with channel behind crest, crossed by short radiating ridges. Branchiostegals 7. Gill rakers long; gill membranes not united. Ventrals well developed.

MERLUCIUS BILINEARIS, (MITCHILL), GILL. (Figure 330.)

Stomodon bilinearis, MITCHILL, Rep. Fishes New York, 1814, 7.

Merlucius bilinearis, GILL, Proc. Acad. Nat. Sci., Phila., 1863, 247.

Gadus albidus, MITCHILL, Journ. Acad. Nat. Sci. Phila., I, 409.

Merlucius albidus, STORER, Hist. Fish. Mass., 363.

A *Merlucius*, distinguished from the common hake of Europe, *M. smiridus*, L., chiefly by the larger scales, of which there are 100 to 110 in the lateral line (about 150 in *M. smiridus*), and by the smaller size of its teeth. The pectorals and ventrals are long, the latter reaching three-fourths of the distance to the vent, their length about three-fifths that of head (a little more than half head in *M. smiridus*).

Radial formula: D. 13+41; A. 40.

Color dark gray, dull silvery below; upper edge of pectoral blackish.

The whiting, or silver hake of the eastern United States ranges from New York to the Gulf of St. Lawrence, where it is common, especially in the Bay of Chaleur, although it has been rarely observed as far north as the Strait of Belleisle. It has been found at considerable depths as far south as lat. 36° and 37°, as is shown in the following list of stations. It appears to spawn in the fall, at a depth of 80–150 fathoms, off the mouth of Narragansett Bay, and there is no evidence that it ever breeds except at considerable depths.

Specimens were taken by the *Albatross* from station 2543, in 39° 58′ 15″ N. lat., 70° 42′ 30″ W. lon., at a depth of 166 fathoms; from station 2560, in 39° 48′ 10″ N. lat., 71° 48′ 40″ W. lon., at a depth of 114 fathoms; from station 2540, in 39° 58′ 20″ N. lat., 70° 52′ W. lon., at a depth of 144 fathoms; from station 2544, in 40° 01′ 45″ N. lat., 70° 24′ W. lon., at a depth of 131 fathoms; from station 2452, in 47° 04′ N. lat., 50° 48′ W. lon., at a depth of 89 fathoms; from station 2422, in 37° 08′ 30″ N. lat., 74° 33′ 30″ W. lon., at a depth of 85 fathoms; from station 2425, in 36° 20′ 24″ N. lat., 74° 46′ 30″ W. lon., at a depth of 119 fathoms; from station 2260, in 40° 13′ 15″ N. lat., 69° 29′ 15″ W. lon., at a depth of 46 fathoms; from station 2249, in 40° 11′ N. lat., 69° 52′ W. lon., at a depth of 53 fathoms; from station 2538, in 39° 57′ 30″ N. lat., 70° 51′ 15″ W. lon., at a depth of 150 fathoms; from station 2248, in 40° 07′ N. lat., 69° 57′ W. lon., at a depth of 67 fathoms; from station 2242, in 40° 15′ 30″ N. lat., 70° 27′ W. lon., at a depth of 58 fathoms; from station 2537, in 39° 56′ 45″ N. lat., 70° 50′ 30″ W. lon., at a depth of 156 fathoms; from station 2536, in 39° 56′ 15″ N. lat., 70° 47′ 30″ W. lon., at a depth of 157 fathoms; from station 2426, in 36° 01′ 30″ N. lat., 74° 47′ 30″ W. lon., at a depth of 93 fathoms; from station 2544, in 40° 01′ 45″ N. lat., 70° 24′ W. lon., at a depth of 131 fathoms; from station 2420, in 37° 03′ 20″ N. lat., 74° 31′ 40″ W. lon., at a depth of 104 fathoms; from station 2423, in 37° 10′ 15″ N. lat., 74° 32′ W. lon., at a depth of 143 fathoms; from station 2424, in 36° 41′ 37″ N. lat., 74° 42′ 15″ W. lon., at a depth of 85 fathoms; from station 2501, in 44° 27′ N. lat., 60° 20′ 15″ W. lon., at a depth of 26 fathoms; from station 2542, in 40° 00′ 15″ N. lat., 70° 42′ 20″ W. lon., at a depth of 129 fathoms; Cat. No. 33398, U. S. N. M., from station 2053, in 42° 02′ N. lat., 68° 27′ W. lon., at a depth of 105 fathoms; Cat. No. 33407, U. S. N. M., from station 2057, in 42° 01′ N. lat., 68° 00′ 30″ W. lon., at a depth of 86 fathoms; Cat. No. 33415, U. S. N. M., from station 2058, in 41° 57′ 30″ N. lat., 67° 58′ W. lon., at a depth of 35 fathoms; from station 2299, in 35° 40′ N. lat., 74° 51′ 30″ W. lon., at a depth of 296 fathoms, and Cat. No. 32678, U. S. N. M.. from station 2004, in 37° 19′ 45″ N. lat., 74° 26′ 06″ W. lon., at a depth of 102 fathoms.

The *Blake* obtained it from station CCCXIII, in 32° 31′ 50″ N. lat., 78° 45′ W. lon., at a depth of 75 fathoms; from station CCCXI, in 39° 59′ 30″ N. lat., 70° 12′ W. lon., at a depth of 143 fathoms; from station CCCXXI, in 32° 43′ 25″ N. lat., 77° 20′ 30″ W. lon., at a depth of 233 fathoms; and from station CCCXLIV, in 40° 01′ N. lat., 70° 58′ W. lon., at a depth of 129 fathoms.

Additional examples were secured by the *Fish Hawk* from station 945, Cat. No. 28809, U. S. N. M., in 39° 58′ N. lat., 71° 13′ W. lon., at a depth of 207 fathoms; Cat. No. 25790, U. S. N. M., from station 792, off Newport, R. I., in 18 fathoms; Cat No. 29061, U. S. N. M., from station 1047, in 38° 31′ N. lat., 73° 21′ W. lon., at a depth of 156 fathoms; Cat. No. 26182, U. S. N. M., from station 895, in 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., at a depth of 238 fathoms; Cat. No. 28826, U. S. N. M., from station 944, in 40° 01′ N. lat., 71° 14′ 30″ W. lon., at a depth of 128 fathoms; Cat. No. 33344, U. S. N. M., from station 1157, in 40° 14′ N. lat., 70° 29′ 15″ W. lon., at a depth of 62 fathoms; Cat. No. 28974, U. S. N. M., from station 1038, in 39° 58′ N. lat., 70° 06′ W. lon., at a depth of 146 fathoms; Cat. No. 28825, U. S. N. M., from station 927, in Vineyard Sound, at a depth of 11 fathoms; Cat. N. 26728, U. S. N. M., from station 897, in 37° 25′ N. lat., 74° 18′ W. lon., at a depth of 157½ fathoms; and Cat.

No. 28857, U. S. N. M., from station 949, in 40° 03′ N. lat., 70° 31′ W. lon., at a depth of 100 fathoms; also by the *Speedwell* from station 238, in 42° 30′ 30″ N. lat., 70° 38′ W. lon., at a depth of 43 fathoms; and from station 214, off Cape Ann, Mass., in 57 fathoms.

MERLUCIUS SMIRIDUS, (RAFINESQUE), GOODE and BEAN.

Gadus merluccius, LINNÆUS, Syst. Nat., I, 439.
Merluccius smiridus, RAFINESQUE, *loc. cit.*
Merluccius vulgaris, FLEMING, et al.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 344.—VAILLANT, Exp. Sci. Travailleur et Talisman, 300.

As might have been predicted from the discovery among the American species, that of Europe has been found to occur at considerable depths southward. The *Travailleur* took it at 306 meters in the Gulf of Gascony in 1880 (station XVII), and the *Talisman* off the coast of Soudan in 640 meters (station LXIII), as well as in 99–118 meters, along the coast of Spain, and by Vinciguerra, at 600 fathoms in the Gulf of Genoa.

Family BREGMACEROTIDÆ.

Bregmacerotidæ, GILL, Arr. Fam. Fish., 1872, 3, (No. 22); Proc. Acad. Nat. Sci., Phila., 1884, 173; Century Dictionary, I, 1889, 675.

Gadoids having a robust caudal portion, truncate or convex behind, almost without procurrent caudal rays above or below; an antemedian anus; moderate suborbitals; terminal mouth; jugular ventrals abnormally developed; an occipital ray; a continuous dorsal fin, mostly confined to the caudal portion, and an anal nearly similar to the long dorsal. (*Gill*).

BREGMACEROS, Thompson.

Bregmaceros, THOMPSON, in Charlesworth's Mag. Nat. Hist. 1840, IV, 184.—Günther, Cat. Fish. Brit. Mus., IV, 368.
Calloptilum, RICHARDSON, Voyage of the Sulphur, Fishes, 94.

Body fusiform, compressed posteriorly, covered with cycloid scales of moderate size. Two dorsal fins; the anterior reduced to a single long ray on the occiput; the second and the anal much depressed in the middle, nearly divided into two; ventrals very long, composed of 5 rays, the outer of which are very elongate. Minute movable teeth round the margin of the mouth and on the vomer; none on the palatines. No air bladder; no pyloric appendages. Gill openings very wide, the gill membranes being united below the throat, not attached to the isthmus. Pseudobranchiæ none; 7 branchiostegals. (*Günther*.)

The type species, *B. Macclellandii*, Thompson, is known from the China seas, the Pacific near the Philippines, and the Indian Ocean. This genus has recently been added to the Atlantic fauna in the form of a well-marked species.

Alcock obtained numerous young specimens of a species of *Bregmaceros* in the Laccadive Sea, in 95 fathoms (Alcock, Ann. and Mag. Nat. Hist., July, 1891, 29).

BREGMACEROS ATLANTICUS, GOODE and BEAN. (Figure 331).

Bregmaceros atlanticus, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, 165.

The species agree very closely with *B. Macclellandii*, Thompson, from which, however, it differs in the lesser number of rays in the first anal, and in the greater height of the vertical fins (judging from figures).

The type (CV) is 46 millimeters long to base of caudal. Form compressed, moderately elongate. Body height (6 millimeters) 7$\frac{2}{3}$ in its length. Interorbital area convex, its width (2$\frac{1}{2}$ millimeters) greater than diameter of eye (2 millimeters), which is 4 in length of head (8 millimeters). Length of head 5$\frac{3}{4}$ in total. Jaws even in front.

Maxilla reaches to vertical through middle of eye; the mandible to vertical through posterior margin of eye.

Teeth on intermaxillary minute, apparently in a single series; mandibulary teeth biserial, the inner teeth enlarged.

Scales large, about 10 in a transverse series, about 65 in a longitudinal series.

Cephalic appendage reaches nearly to base of first dorsal, its length (10 millimeters) 4½ in total.

Distance of dorsal from snout (17 millimeters) 2¼ in total; that of anal the same.

The dorsal and anal fins received in a groove formed by the scales along their bases.

Anterior portion of second dorsal and second anal less elevated than in *B. Macclellandii*. The differentiations between the developed and undeveloped rays of the anal are so slight that the limits of the so-called anterior and posterior sections of the fin can not be determined.

Length of the longest anal ray (22 millimeters) about 2 in body length.

Radial formula: D. 1 + 15–16; A. 15–16 + x (7 or 8) + 21–22.

Specimens were obtained by the *Blake* at the following stations: XCIX, off Granada, 90 fathoms; CXIII, off Neris, 305 fathoms; CLXXXV, lat. 25° 33′ N., lon. 84° 21′ W., 101 fathoms.

Family MACRURIDÆ.

Macruridæ, BONAPARTE, Nuovi Annali Sci. Nat. (857), 1838, 132; Catologo Metodico, 1876, 41.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 390.—GILL, Arr. Fam. Fish., 1872, 3 (No. 16); Johnson's Cyclopædia, II, 1614; Proc. Acad. Nat. Sci. Phila., 1864, 174.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 811.

Lepidolepridæ, SWAINSON, Hist. Nat. Fish., 1839, II, 179.

Lepidosomatidæ, ADAMS, Man. Nat. Hist., 1864, 101.

Gadoidea with body terminating in a tapering, long, and compressed tail, and covered by keeled or ornamented scales. Teeth villiform or cardiform, in bands in jaws. Premaxillary protractile. First dorsal near the head, distinct and short; second of feeble rays, similar to the anal, the two encompassing the tail. No differentiated caudal. Ventrals thoracic or jugular and of several rays. Pseudobranchiæ none. Air-bladder present.

SYSTEMATIC KEY TO THE SUBFAMILIES AND GENERA.

(After Günther, modified and extended.)

I. A fold of membrane of gill-cavity across terminal portion of first branchial arch. Barbel present. 4 gills. No pseudobranchiæ .... *Macrurinæ*
  A. Teeth in villiform bands above and below, that of the lower jaw always broadest near the symphysis, and sometimes tapering into a series on the side of the jaw.
    1. Scales distinctly imbricate, without enlarged dorsal scales.
      a. Scales spinigerous.
        Mouth inferior; infraorbital ridge more or less distinct. Dorsal spine serrated...MACRURUS
        Mouth entirely at the lower side of the head, a longitudinal ridge dividing the infraorbital region into a vertical and subhorizontal portion. Dorsal spine smooth. CŒLORHYNCHUS
        Mouth wide and lateral.
          Dorsal spine finely barbed .... CORYPHÆNOIDES
          Dorsal spine smooth .... *HYMENOCEPHALUS* (=MYSTACONURUS)
      b. Scales smooth .... LIONURUS
    2. Scales indistinct, the whole skin covered with villosities .... TRACHONURUS
    3. A series of enlarged scales along the base of the dorsal and anal fins .... CETONURUS
  B. Intermaxillary heterodont, with an outer series of strong, widely-set teeth, and an inner villiform band; mandibulary teeth uniserial.
    1. Dorsal spine serrated .... CHALINURA
    2. Dorsal spine smooth .... OPTONURUS
  C. Intermaxillary teeth uni- or biserial; mandibulary teeth uniserial.
    1. Dorsal origin over origin of pectoral.
      a. Ventrals short and weak, pectorals placed very high, opposite upper angle of gill-cleft; lateral line originating at upper angle of gill-cleft. Muciferous cavities wide. Dorsal spine smooth. Scales small, bristly .... MALACOCEPHALUS
    2. First dorsal behind origin of pectorals. Muciferous cavities small.
      a. Dorsals separated by a considerable space. Dorsal and anal similar in height and appearance .... NEMATONURUS
      b. Dorsals subcontnuous. Anal much higher than second dorsal .... MOSELEYA
  D. Intermaxillary teeth villiform; mandibulary teeth uniserial.
    1. Dorsal, ventral and pectoral origins nearly in the same vertical. Pectorals very long, spatu- .... ABYSSICOLA

II. First branchial arch free .... *Trachyrhynchinæ*
  A. Snout elongate, pointed.
    1. A scaleless fossa on each side of the nape. Teeth in villiform bands in jaws. A row of armed scales at base of vertical fins anteriorly. Operculum very small. Barbel present. TRACHYRHYNCHUS
    2. No scaleless fossa. Teeth biserial in upper jaw, with outer series enlarged; uniserial in lower jaw. No barbel.
      a. No vomerine teeth. Bones of head firm, with narrow cavities. Mouth wide, lateral. Tail not very elongate .... MACRURONUS
      b. Vomerine teeth. Bones of head soft and cavernous. Tail very long and flagelliform. Vent very far forward. Anal fin with a distinct elevated portion..... STEINDACHNERIA
  B. Snout short and blunt; jaws even in front. Teeth in jaws in villiform bands. Bones of head soft and cavernous. 3½ gills .... BATHYGADUS

MACRURUS, Bloch.

Macrourus, BLOCH, Syst. Ichth., v, 1787, 152 (type, *M. rupestris*, Bloch and Fabricius = *M. berglax*, Lacépède).
Macrurus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 390.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 811.
Macruroplus, BLEEKER, Versl. Med. K. Akad. Wetensch., Amsterdam, VIII, 369 (type, *M. serratus*, Lowe).

Snout more or less produced, and conical or triangular; mouth inferior, rather small, infraorbital ridge more or less distinct; teeth in villiform bands in jaws, palate toothless. Barbel present. Scales spinigerous, imbricated, lateral line slightly arched anteriorly. No scaleless fossa on side of nape. Dorsal spine serrated. Other characters in common with the other genera of *Macrurinæ*.

In addition to the Atlantic forms the following have been noted elsewhere:

Macrurus investigatoris, Alcock (Ann. and Mag. Nat. Hist., 1889 (Nov.), 391, Ill. Zoöl. *Investigator*, I, pl. III, fig. 4) from Andaman Sea, 265–490 fathoms; Bay of Bengal, 193–405 fathoms; Laccadive Sea, 188–276 fathoms. This is the common species of the Indian Ocean, occupying the same place which *M. Bairdii* fills in the Western Atlantic.

M. semiquincunciatus, Alcock (*loc. cit.* 392), from the Bay of Bengal, near the Andamans, in 130–250 fathoms, and from the Laccadive Sea, 240–276 fathoms (Alcock, Ann. and Mag. Nat. Hist., VIII, 1891, 121).

Macrurus Hoskynii, Alcock (Ann. and Mag. Nat. Hist., 1890, II, 214), from the Bay of Bengal, off Madras, Investigator station 97, in 1,310 fathoms. This is the deepest locality for *Macrurus* yet found in the Bay of Bengal.

Macrurus Hextii, Alcock (Ann. and Mag. Nat. Hist., 1890, II, 299), from the Arabian Sea, *Investigator* station 104, 1,000 fathoms.

Macrurus Wood-Masoni, Alcock (*loc. cit.*, 301). From same locality as last and in the Laccadive Sea, 738 fathoms.

Macrurus Petersonii, Alcock (Ann. and Mag. Nat. Hist., VIII, 1891, 121, Ill. Zoöl. *Investigator*, I, III, fig. 5), from the Laccadive Sea, in 188 to 220 fathoms.

Macrurus brevirostris, Alcock (Ann. and Mag. Nat. Hist., 1889, 393), from the Andaman Sea, 7½ miles east of North Cinque Island, in 490 fathoms.

Macrurus macrolophus, Alcock (*loc. cit.*), from the Andaman Sea, southeast by south of Ross Island, in 265 fathoms, and from the Laccadive Sea, 230 to 276 fathoms.

Macrurus lophotes, Alcock (*loc. cit.*, Ill. Zoöl. *Investigator*, I, pl. III, fig. 2), from the "Swatch" in the Bay of Bengal, 285 to 405 fathoms.

Macrurus polylepis, Alcock (*loc. cit.*), from the Bay of Bengal, 193 and 272 fathoms.

Macrurus rudis, Günther (Challenger Report, XXII, 131, pl. XXVII), from the Pacific, north of the Kermadecs, in 520 to 630 fathoms.

Macrurus nasutus, Günther (*loc. cit.*, pl. XXX, Fig. B), from off Japan, 345 to 565 fathoms, and from the Laccadive Sea, *Investigator* station 107, in 738 fathoms (Alcock, Ann. and Mag. Nat. Hist., VIII, 1891, 121).

Macrurus serrulatus, Günther (Ann. and Mag. Nat. Hist., 1878, II, 26), from northeast of New Zealand, in 700 fathoms.

Macrurus asper, Günther (Challenger Report, XXII, 137, pl. XXXVI, fig. A), from south of Japan, 1,875 fathoms.

Macrurus carinatus, Günther (*loc. cit.*, pl. XXXIII, Fig. A), from near Prince Edward Island, in 310 fathoms.

Macrurus stelgidolepis, Gilbert (Proc. U. S. Nat. Mus., XIII, 1890, 116), was taken by the *Albatross* off the coast of California in 267 fathoms.

MACRURUS BERGLAX, Lacépède. (Figure 334.)

Macrurus berglax, Lacépède, Hist. Nat. Poiss.—Jordan, Cat. Fish. N. Amer., 1887, 131.

Macrurus Fabricii, Sundeval, Vet. Akad. Handl., 1840, 6.—Collett, Norges Fiske, 1875, 128—Lilljeborg, Sverig. og. Norges Fiske, 242.—Goode and Bean, Cat. Fish. Essex Co. and Mass. Bay, 1879, 7.—Günther, Challenger Report, XXII, 130.

Macrurus rupestris, Günther, Cat. Fish. Brit. Mus., IV, 1862, 390.

Short snout, subtrihedral, pointed in front, much shorter than the large eye, which is one-third or two-fifths the length of the head in adult specimens. Intermaxillary very short, one-half length of maxillary, and not continued beyond its expanded vertical process. The eye is oblong. The whole under-surface of the head below the suborbital and nasal ridge is naked. Axil of pectoral naked. Space between the ventrals scaled. Body scales each with a single strong median keel, made up of 5 or 8 spines directed backwards. Some scales, particularly of the head, have also 2 lateral keels. There are 6 longitudinal series of scales between the first dorsal fin and the lateral line. The first dorsal spine indistinctly denticulated towards the point. The length of the pectoral is nearly or quite one-half the length of the head. The longest spine of the dorsal is very finely serrated along its anterior margin, the serrations becoming obsolete near its base. Vent situated behind the origin of the second dorsal fin. Gill-rakers very small, tubercular; 9 to 11 on the first arch. The gill-membranes broadly joined, free from the isthmus behind.

Radial formula: D. 12+124; A. 148; P. 18–19; V. 8.

This form, originally discovered on the coast of Norway, has been found abundantly as far south as Georges Bank, where the halibut fishermen catch it, or some closely allied form, on their trawls. The first specimen seen by American naturalists was picked up floating at the surface, off the mouth of New York Harbor. The *Albatross* obtained it from station 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., at a depth of 677 fathoms. Günther knew it from Finmark and Greenland, as well as from New England. He calls attention to remarkable individual variations in the specimens examined by him. His critical remarks in this connection are of great importance. (Challenger Report, XXII, 130.)

MACRURUS SCLERORHYNCHUS, Valenciennes.

Lepidoleprus sclerorhynchus, Valenciennes, in Webb and Berthelot, Ichthyologie des Iles Canaries, 1836–44, 80, pl. XIV, fig. 1.

Macrurus sclerorhynchus, Valenciennes, *loc. cit.*—Günther, Cat. Fish. Brit. Mus., IV, 394; Challenger Report, XXII, 1887, 133, pl. XXXII, fig. A.—Vinciguerra, Ann. Mus. Genova, XIV, 1879, 622, pl. II.—Vaillant, Exp. Sci. Travailleur et Talisman, 237, pl. XXII, fig. 3.

Snout conically projecting beyond the mouth, with sharp and smooth canthus rostralis; a rough protuberance in front, and one on each side of the canthus. Mouth rather small, situated at the lower side of the snout; infraorbital ridge sharp, prominent in its whole length. The cleft of the mouth does not extend to below the center of the eye. Teeth in villiform bands, in both jaws; those of the outer series of the upper jaw scarcely stronger than the others. Barbel short and slender. Interorbital space flat, its width being equal to the vertical diameter of the eye. The horizontal diameter of the eye equals the length of the snout, and is two-sevenths of that of the head.

The scales are covered with very small spinelets, which are arranged in about nine series, the middle series being sometimes more prominent than the others; only the terminal spinelets of the central series projects sometimes beyond the margin of the scale. There are 6 scales in a transverse series between the first dorsal spine and the lateral line. Second dorsal spine somewhat produced, armed in front with rather closely set barbs. The distance between the 2 dorsal fins equals the length of the head, the snout not included. The outer ventral ray produced into a filament. Color, brown.

Radial formula: D. 11; A. 95; P. 17; V. 7. (*Günther.*)

The form identified by Günther with the Canarian species of Webb and Berthelot was obtained 90 miles southeast of Cape St. Vincent, at a depth of 1,090 fathoms. He believes it to be the same as the Mediterranean species placed under the name by Vinciguerra. The French explorers obtained 141 specimens off Morocco, Soudan, and the Canaries, at 500 to 2,600 fathoms.

Macrurus smiliophorus, Vaillant (242, Pl. XXII, Fig. 1), is very close to *M. sclerorhynchus*, as may be seen by comparison of his figure with that of Vinciguerra. The differences in the squamation and in the form of the sagitta do not appear to be sufficiently demonstrated to warrant the acceptance of his species. All his specimens were obtained from the region region inhabited by *M. sclerorhynchus*, N. Atlantic, 460–1319 meters.

MACRURUS ÆQUALIS, (GÜNTHER), GOODE and BEAN.

Coryphænoides æqualis, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 25; Challenger Report, XXII, 1887, 134, Pl. XXXII, fig. C.

Coryphænoides serratus, WYVILLE THOMSON, The Atlantic, I, 118, fig. 3.

Coryphænoides æqualis, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, p. 228—"certains individus." [Desc. and fig. belong to C. sublævis, Vaillant, *op. cit.*, p. 386.]

Snout conical, projecting beyond the mouth, with rather obtuse and rough upper edge; the left of the mouth extends nearly to below the center of the eye. The teeth of the outer series are visibly stronger than the remainder. Barbel slender, but not so long as the eye. The upper profile rises rather suddenly towards the anterior dorsal spine. The interorbital space is flat, its width being considerably less than the diameter of the eye, which conspicuously exceeds the length of the snout, and is one-third or rather more than one-third the length of the head. The scales are equally rough over the whole of their surface, the spinelets being subequal in size, densely packed, but arranged in from 8 to 12 series, the middle series not being more prominent than the others (as is the case in *Macrurus sclerorhynchus*). The entire margin of the scale is spinous. There are 8 scales in a transverse series between the first dorsal and the lateral line. Second dorsal spine somewhat produced, armed along its anterior edge with barbs pointing upwards and rather closely set. The second dorsal fin commences at a distance from the first which is less than the length of the head. The outer ventral ray not, or but slightly, produced. Lower part of the head and antero-superior portion of the first dorsal black.

1 D. 12; A. 90–118; P. 17; V. 9. (*Günther.*)

The *Challenger* obtained 2 specimens, 8 to 9 inches long, Günther's types, from 600 fathoms south of the coast of Portugal. The species is very close to *M. rudis*, Günther, from the Kermadec Islands in the Pacific.

MACRURUS SERRATUS, LOWE. (Doubtful species.)

Macrurus serratus, LOWE, Proc. Zool. Soc., London, 1843, '91 ("a single specimen, which was not seen until it had been partly dried.")

Macrurus pallide cinereo-fuscus, scaber, squamis rectinato-striatis, inermibus ecarinatis: capite rostroque brevibus, simplicibus (nec cœlatis nec carinatis); oculis rotundatis; dentibus scobinatis; pinnæ dorsalis primæ altæ radio primo valido spinoso-serrato; ventralium in filamentum producto.

1^{ma} D. 1–9; 2^{da} D. 100 fere; A. 80–90; V. 1–7v8; P. 19; M. B. 7. (*Lowe, loc. cit.*)

The description quoted above is very indefinite: Günther places the name of Lowe doubtfully in the synonymy of *M. æqualis*. It is closer, however, to *M. sclerorhynchus*, having a filament at the tip of the ventral ray. Günther states that the form of which Wyville Thomson gave a figure under the name of *Coryphænoides serratus* was *M. æqualis*.[1]

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[1] Voyage of the *Challenger*. The Atlantic, I, 118, fig. 3.

[2] Pelagos, 1889, 228.

MACRURUS BAIRDII, GOODE and BEAN. (Figure 335.)

Macrurus Bairdii, GOODE and BEAN, Amer. Journ. Sci. and Arts, XIV, 1877, 471-473 (Massachusetts Bay); Cat. Fish. Essex Co. and Mass. Bay, 1879, 7; Bull. Mus. Comp. Zoöl. XIX, p. 195.—GOODE, Proc. U. S. N. M., III, 337, 475.—GÜNTHER, Challenger Report, XXII, 1887, 135, Pl. XXXII, fig. B.

Body tapering from first dorsal to tip of tail, much compressed posteriorly, its greatest height over origin of pectorals (0.037 meter) contained 8 times in length; its greatest width at the same point (0.022 meter, contained 13 times in length.

Scales irregularly polygonal, the free portions covered with transparent, vitreous spines, arranged in from 10 to 12 irregular longitudinal rows. On head and upper part of body, in advance of first dorsal, the median row of spines is the most prominent, and presents the appearance of a low median keel.

Lateral line nearly straight, formed by a smooth groove, which replaces two or three median rows of spines of each scale. Number of scales in lateral line, 152; 6 transverse rows above it and 19 or 20 rows below it, counting from vent obliquely backward.

Greatest length of head (0.045 meter) equals distance between first and twenty-third anal rays, and is contained 6½ times in extreme length. Greatest height at posterior margin of orbit (0.028 meter), greater than width at same point (0.023 meter), 1⅗ times in length of head. Width of interorbital area (0.012 meter) equal to length of snout (0.013 meter) and length of maxillary (0.013 meter). Length of postorbital region (0.017 meter), about equal to horizontal diameter of orbit (0.016 meter). Length of operculum (0.007 meter) about half the length of mandible (0.015 meter).

Snout sharp, a front view presenting four ridges radiating from the tip at right angles to each other, the lower one being merely a fold in the skin of the under surface of the head. The horizontal ridges are continued into the ridges upon the suborbitals. Ridge extending backward from tip of snout upon top of head is lost in the interorbital space. Branches of the horizontal ridges are continued upon the upper margins of orbits, and there disappear. Nostrils immediately in front of orbit, the posterior pair much the longer.

Mouth situated entirely on lower side of head; symphysis of lower jaw in vertical from anterior margin of orbit, and articulations of mandibles in vertical from posterior margin of orbit; width of cleft of mouth (0.012 meter) equal to distance between symphysis of maxillaries and line connecting their articulations. Upper jaw protractile vertically. Barbel 0.005 meter in length.

Teeth conical, somewhat recurved, of nearly uniform size, arranged in villiform bands. Palate smooth.

Distance of first dorsal from snout (1.057 meters) about 4 times the length of its base (0.014 meter), and from anterior margin of orbit equal to length of head. First spine very short (0.002 meter,) not much longer than the teeth of the second spine. Second spine in length (0.032 meter) twice horizontal diameter of orbit, stout, its anterior margin armed from base to tip with 15 teeth pointing upward, the uppermost slender; its length to tip of filament (0.03 meter) is almost equal to distance from origin of second dorsal (0.038 meter), this tip when laid back reaching almost to second dorsal. Rays decreasing regularly in length, so that, when the fin is upright, its shape approximates that of a right-angled triangle, the hypothenuse of which is the second dorsal spine and its perpendicular side a line touching the tips of the rays.

Length of base of second dorsal (0.204 meter) less than that of the anal, its origin over the thirtieth scale of lateral line. Length of longest ray (in posterior third) 0.004 meter, which is less than length of barbel. All rays very feeble. Membrane scarcely perceptible.

Distance of anal from snout (0.070 meter) 3⅓ times in its length of base, its origin under 18th scale of lateral line. Length of first ray (0.006 meter) one-half the length of tenth ray (0.012 meter), and 3 times the length of last ray (0.002 meter), the length of rays increasing to a point beneath anterior part of first dorsal, and thence gradually decreasing to tip of tail.

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[1] Cat. No., U. S. National Museum, 21014.

Distance of pectoral from snout (0.048 meter) 4 times width of interorbital area; its length (0.029 meter) twice the length of mandible. Insertion above the middle of the depth of the body, on a level with center of orbit, its third ray longest, its tip reaching to vertical from base of fourth anal ray.

Insertion of ventral behind pectoral and almost under that of first dorsal; its distance from snout (0.053 meter) slightly exceeding twice its length (0.025 meter). Tip of ventral filament reaches to base of third anal ray.

Radial formula: D. II, 11, 137; A. 120; P. 15; V. 7.

Color: Ground color, light brownish gray; under parts, silvery; belly, darker, bluish. Under surface of snout, pink, as is also the first dorsal except spines. Spines of dorsal, ventral and anterior anal rays, blackish. Throat, branchiostegal membrane and isthmus, rich deep violet. Sclerotic coat, green. Eyes, very dark blue.

Spermaries well developed, but milt not mature. Individual apparently adult.

The species was dedicated to Prof. Spencer F. Baird, and was the first deep-sea fish obtained by the Fish Commission or described by an American ichthyologist. It ranges from 150 to 1,255 fathoms.

This species is distinguished by Günther from his *Macrurus æqualis*, which it closely resembles, (1) by its longer snout, which is nearly equal to the diameter of the eye; and (2) the smaller number of the ventral rays (7).

Numerous specimens were obtained by the *Blake* from station CCCIII, in 41° 34′ 30″ N. lat., 65° 54′ 30″ W. lon., at a depth of 306 fathoms; from station CCCVI, in 41° 32′ 50″ N. lat., 65° 55′ W. lon., at a depth of 524 fathoms; from station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; from station CCCXII, in 39° 50′ 45″ N. lat., 70° 11′ W. lon., at a depth of 466 fathoms; from station CCCXVI, in 32° 07′ N. lat., 78° 37′ 30″ W. lon., at a depth of 229 fathoms; from station CCCXVII, in 31° 57′ N. lat., 78° 18′ 35″ W. lon., at a depth of 333 fathoms; from station CCCXXV, in 33° 35′ 20″ N. lat., 76° W. lon., at a depth of 647 fathoms; from station CCCXXVI, in 33° 42′ 15″ N. lat., 76° 00′ 50″ W. lon., at a depth of 464 fathoms; from station CCCXXIX, in 34° 39′ 40″ N. lat., 75° 14′ 40″ W. lon., at a depth of 603 fathoms; from station CCCXXXII, in 35° 45′ 30″ N. lat., 74° 48′ W. lon., at a depth of 263 fathoms; from station CCCXXXIV, in 38° 20′ 30″ N. lat., 73° 26′ 40″ W. lon., at a depth of 395 fathoms; from station CCCXXXVI, in 38° 21′ 50″ N. lat., 73° 32′ W. lon., at a depth of 197 fathoms; from station CCCXXXVII, in 38° 20′ 08″ N. lat., 73° 23′ 20″ W. lon., at a depth of 740 fathoms; from station CCCXLIII, in 39° 45′ 40″ N. lat., 70° 55′ W. lon., at a depth of 732 fathoms; from station LXXVII, off Neris; from station CCLXXII, and from station CCCXXXII in 35° 45′ 30″ N. lat., 74° 48′ W. lon., at a depth of 263 fathoms.

The *Albatross* secured examples from station 2396, in 28° 34′ N. lat., 86° 48′ W. lon., at a depth of 335 fathoms; Cat. No. 35506, U. S. N. M., from station 2178, in 39° 29′ N. lat., 72° 05′ 15″ W. lon., at a depth of 229 fathoms; Cat. No. 35685, U. S. N. M., from station 2262, in 39° 54′ 45″ N. lat., 62° 29′ 45″ W. lon., at a depth of 250 fathoms; Cat. No. 32656, U. S. N. M., from 37° 16′ 30″ N. lat., 74° 26′ 36″ W. lon.; Cat. No. 32808, U. S. N. M., from station 2014, in 36° 41′ 05″ N. lat., 74° 38′ 55″ W. lon., at a depth of 373 fathoms; Cat. No. 33326, U. S. N. M., from station 2048, in 40° 02′ 68″ N. lat., 50° 30′ W. lon., at a depth of 547 fathoms; Cat. No. 33387, U. S. N. M., from station 2061, in 42° 10′ N. lat., 66° 47′ 45″ W. lon., at a depth of 115 fathoms; Cat. No. 33397, U. S. N. M., from station 2053, in 42° 02′ N. lat., 68° 27′ W. lon., at a depth of 105 fathoms; Cat. No. 33406, U. S. N. X., from station 2064, in 42° 25′ 40″ N. lat., 66° 08′ 35″ W. lon., at a depth of 122 fathoms; Cat. No. 33410, U. S. N. M., from station 2063, in 42° 23′ N. lat., 66° 23′ W. lon., at a depth of 141 fathoms; Cat. No. 33418, U. S. N. M., from station 2062, in 42° 17′ N. lat., 66° 37′ 15″ W. lon., at a depth of 150 fathoms; Cat. No. 33450, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 33456, U. S. N. M., from station 2077, in 41° 09′ 40″ N. lat., 66° 02′ 20″ W. lon., at a depth of 1,255 fathoms; Cat. No. 33513, U. S. N. M., from station 2092, in 39° 58′ 35″ N. lat., 71° 00′ 30″ W. lon., at a depth of 197 fathoms; Cat. No. 35427, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; Cat. No. 35428, U. S. N. M., from station 2179, in 39°

30′ 10″ N. lat., 71° 50′ W. lon., at a depth of 510 fathoms; Cat. No. 35430, U. S. N. M., from station 2171, in 37° 59′ 30″ N. lat., 73° 48′ 40″ W. lon., at a depth of 444 fathoms; Cat. No. 35432, U. S. N. M., from station 2172, in 38° 01′ 15″ N. lat., 73° 44′ W. lon., at a depth of 568 fathoms; Cat. No. 35434, U. S. N. M., from station 2181, in 39° 29′ N. lat., 71° 46′ W. lon., at a depth of 693 fathoms; Cat. No. 35487, U. S. N. M., from station 2189, in 39° 49′ 30″ N. lat., 70° 26′ W. lon., at a depth of 600 fathoms; Cat. No. 35503, U. S. N. M., from station 2176, in 39° 32′ 30″ N. lat., 72° 21′ 30″ W. lon., at a depth of 302 fathoms; from station 2125, in 11° 43′ N. lat., 69° 09′ 30″ W. lon., at a depth of 208 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon., at a depth of 280 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2415, in 30° 44′ N. lat., 79° 26′ W. lon., at a depth of 440 fathoms; from station 2522, in 42° 20′ N. lat., 65° 07′ 30″ W. lon., at a depth of 104 fathoms; from station 2537, in 39° 56′ 45″ N. lat., 70° 50′ 30″ W. lon., at a depth of 156 fathoms; from station 2470, in 44° 47′ N. lat., 56° 33′ 45″ W. lon., at a depth of 224 fathoms; from station 2471, in 44° 34′ N. lat., 56° 41′ 45″ W. lon., at a depth of 218 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2552, in 39° 47′ 07″ N. lat., 70° 35′ W. lon., at a depth of 721 fathoms; from station 2479, in 44° 05′ 45″ N. lat., 57° 16′ 45″ W. lon.; at a depth of 129 fathoms; from station 2513, in 43° 34′ N. lat., 65° 56′ 30″ W. lon., at a depth of 134 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon., at a depth of 280 fathoms; from station 2547, in 39° 54′ 30″ N. lat., 70° 20′ W. lon., at a depth of 390 fathoms; from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; from station 2395, in 28° 36′ 15″ N. lat., 86° 50′ W. lon., at a depth of 347 fathoms; from station 2025, in 40° 02′ N. lat., 70° 27′ W. lon., at a depth of 239 fathoms; from station 2394, in 28° 38′ 30″ N. lat., 87° 02′ W. lon., at a depth of 420 fathoms; from station 2430, in 42° 58′ 30″ N. lat., 50° 50′ W. lon., at a depth of 179 fathoms; from station 2533, in 40° 16′ 30″ N. lat., 67° 26′ 15″ W. lon., at a depth of 828 fathoms; from station 2530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; from station 2392, in 28° 47′ 30″ N. lat., 87° 27′ W. lon., at a depth of 724 fathoms; from station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; from station 2027, in 39° 58′ 25″ N. lat., 70° 37′ W. lon., at a depth of 198 fathoms; Cat. No. 33007, U. S. N. M., from station 2030, in 39° 29′ 45″ N. lat., 71° 43′ W. lon., at a depth of 588 fathoms; Cat. Nos. 33006 and 33537, U. S. N. M., from station 2028, in 39° 57′ 50″ N. lat., 70° 32′ W. lon., at a depth of 209 fathoms; Cat. No. 33008, U. S. N. M., from station 2025, in 40° 02′ N. lat., 70° 37′ W. lon., at a depth of 239 fathoms; from station 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., at a depth of 677 fathoms; from station 2186, in 39° 52′ 15″ N. lat., 70° 55′ 30″ W. lon., at a depth of 353 fathoms; from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; from station 2395, in 28° 36′ 15″ N. lat., 86° 50′ W. lon., at a depth of 347 fathoms; from station 2552, in 39° 47′ 07″ N. lat., 70° 35′ W. lon., at a depth of 721 fathoms; from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; from station 2290, in 35° 40′ N. lat., 74° 51′ 30″ W. lon., at a depth of 296 fathoms; from station 2476, in 44° 28′ 50″ N. lat., 57° 10′ 30″ W. lon., at a depth of 200 fathoms; from station 2175, in 39° 33′ N. lat., 72° 18′ 30″ W. lon., at a depth of 452 fathoms; from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., at a depth of 571 fathoms; from station 2554, in 39° 48′ 30″ N. lat., 70° 40′ 30″ W. lon., at a depth of 445 fathoms; from station 2416, in 31° 26′ N. lat., 79° 07′ W. lon., at a depth of 276 fathoms; from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms; from station 2415, in 30° 44′ N. lat., 79° 26′ W. lon., at a depth of 440 fathoms; from station 2110, in 35° 12′ 10″ N. lat., 74° 57′ 15″ W. lon., at a depth of 516 fathoms; from station 2429, in 42° 55′ 30″ N. lat., 50° 51′ W. lon., at a depth of 471 fathoms; from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30 W. lon., at a depth of 523 fathoms; from station 2469, in 44° 58′ 37″ N. lat., 56° 20′ 45″ W. lon., at a depth of 201 fathoms; from station 2461, in 45° 47′ N. lat., 54° 13′ 30″ W. lon., at a depth of 59 fathoms; and from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms.

The *Fish Hawk* secured specimens from the following localities: Cat. No. 26062, U. S. N. M., from stations 879–880, between 39° 40′ 30″ N. lat., 70° 54′ W. lon., and 39° 48′ 30″ N. lat., 70° 54′ W. lon., at a depth of from 225 to 252½ fathoms; Cat. Nos. 26163, 26166, 26187, and 26194, U. S. N. M., from station 893, in 39° 52′ 20″ N. lat., 70° 58′ W. lon., at a depth of 272 fathoms; Cat. Nos. 26168, 26194, 26217, and 26218, U. S. N. M., from station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms; Cat. Nos. 26191, 26195, and 26210, U. S. N. M., from station 895, in 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., at a depth of 238 fathoms; Cat. No. 26193, U. S. N. M., from station 892, in 39° 46′ N. lat., 71° 05′ W. lon., at a depth of 487 fathoms; Cat. Nos. 26212, 26217, and 26218, U. S. N. M., from station 891, in 39° 46′ N. lat., 71° 10′ W. lon., at a depth of 480 (?) fathoms; Cat. Nos. 25924 and 26065, U. S. N. M., from station 870, in 40° 02′ 36″ N. lat., 70° 22′ 58″ W. lon., at a depth of 155 fathoms; Cat. No. 26060, U. S. N. M., from station 879, in 39° 49′ 30″ N. lat., 70° 54′ W. lon., at a depth of 225 fathoms; Cat. No. 26103, U. S. N. M., from station 881, in 39° 46′ 30″ N. lat., 70° 54′ W. lon., at a depth of 325 fathoms; Cat. No. 26110, U. S. N. M., from station 879, in 39° 49′ 30″ N. lat., 70° 54′ W. lon., at a depth of 225 fathoms; Cat. No. 26126, U. S. N. M., from station 880, in 39° 48′ 30″ N. lat., 70° 54′ W. lon., at a depth of 352½ fathoms; Cat. No. 26198, U. S. N. M., from station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms; Cat. No. 26734, U. S. N. M., from station 898, in 37° 24′ N. lat., 74° 17′ W. lon., at a depth of 300 fathoms; Cat. No. 28722, U. S. N. M., from station 925, in 39° 55′ N. lat., 70° 47′ W. lon., at a depth of 229 fathoms; Cat. No. 28739, U. S. N. M., from station 924, in 39° 57′ 30″ N. lat., 70° 46′ W. lon., at a depth of 164 fathoms; Cat. No. 28773, U. S. N. M., from station 938, in 39° 51′ N. lat., 69° 49′ 15″ W. lon., at a depth of 317 fathoms; Cat. No. 28787, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; Cat. No. 28852, U. S. N. M., from station 952, in 39° 55′ N. lat., 70° 28′ W. lon., at a depth of 396 fathoms; Cat. No. 28892, U. S. N. M., from station 1026, in 39° 50′ 30″ N. lat., 71° 23′ W. lon., at a depth of 182 fathoms; Cat. No. 28896, U. S. N. M., from station 997, in 39° 42′ N. lat., 71° 32′ W. lon., at a depth of 335 fathoms; Cat. No. 28903, U. S. N. M., from station 999, in 39° 45′ 13″ N. lat., 71° 30′ W. lon., at a depth of 266 fathoms; Cat. No. 28909, U. S. N. M., from station 1025, in 39° 49′ N. lat., 71° 25′ W. lon., at a depth of 216 fathoms; Cat. No. 28913, U. S. N. M., from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; Cat. No. 28931, U. S. N. M., from station 1028, in 39° 57′ N. lat., 69° 17′ W. lon., at a depth of 410 fathoms; Cat. No. 29049, U. S. N. M., from station 1045 in 38° 35′ N. lat., 73° 13 W. lon., at a depth of 312 fathoms; Cat. No. 29078, U. S. N. M., from station 1049, from 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; Cat. No. 31746, U. S. N. M., from station 1128, in Vineyard Sound, at a depth of 9 fathoms; Cat. No. 31770, U. S. N. M., from station 1143, in 39° 29′ N. lat., 72° 01′ W. lon., at a depth of 452 fathoms; Cat. No. 31855, U. S. N. M., from station 1153, in 39° 54′ N. lat., 70° 37′ W. lon., at a depth of 225 fathoms; and Cat. No. 31880, U. S. N. M., from station 1154, in 39° 55′ 31″ N. lat., 70° 39′ W. lon., at a depth of 193 fathoms.

MACRURUS HOLOTRACHYS, GÜNTHER.

Macrurus holotrachys, GÜNTHER, Ann. and Mag. Nat. Hist., 1878, II, 24.; Challenger Report, XXII, 00, Pl. XXVIII, fig. B.—VAILLANT, Exp. Sci. Trav. et Tal., 241, pl. XXII, fig. 3.

Snout moderately produced, as long as the eye, which is large, one-third of the length of the head, its vertical diameter being considerably more than the width of the interorbital space. Anterior edge of the snout with three rough prominences, one in the middle and one on each side. Mouth inferior, lower side of the head naked. Each scale with a median series of spinelets, and with two or more isolated spinelets besides; the medians are the strongest, forming with their fellows continuous longitudinal lines on the body. Upper and lateral portions of the head covered with irregular, rough scales; lower naked. There are five scales in a transverse series between the first dorsal spine and lateral line. Teeth of the lower jaw in a very narrow band. Distance between the two dorsal fins scarcely equal to the length of the base of the first. Second dorsal spine with small barbs anteriorly;

outer ventral ray produced into a short filament. Distance of the vent from the isthmus equal to the length of the head without snout. Barbel very small. No bands or spots.

Radial formula: D. 11; A. 115; P. 21; V. 9.

This species is known from a single specimen from off the mouth of the Rio de la Plata at a depth of 600 fathoms. Vaillant identifies 4 individuals, taken off Morocco in 2,115–2,200 meters, with this form.

M. zaniaphorus, Vaillant (p. 245), is said by its author to resemble *M. holotrachys* and also *M. sclerorhynchus*. The types were in bad condition, and Vaillant seems to depend upon the scales for his chief diagnostic character. In the absence of a figure we hesitate to admit the species.

CŒLORHYNCHUS, Giorna.

Cœlorhynchus, GIORNA, Mem. Acad. Sci. Turin, XVI, 1803, 178, pl. I, figs. 3, 4 (type, *Cœlorhinque La Ville, L. cœlorhynchus*, Risso).

Cœlorhynchus (subgenus), GÜNTHER, Challenger Report, XXII, 124.

Paramacrurus, BLEEKER, Versl. Med. K. Ak. Wetensch. Amsterdam, 1874, 103 (type, *Lepidoleprus australis*, Rich).

Oxymacrurus, BLEEKER, *loc. cit.* (type, *M. japonicus*, Schl.).

A genus with characters of *Macrurus*, with teeth in villiform bands above and below, imbricate and spinigerous scales, mouth completely inferior and a longitudinal ridge dividing the interior region into vertical and subhorizontal portions. Dorsal spine smooth.

Cœlorhynchus parallelus, Günther (Challenger Report, XXII, 125, pl. XXIX, Fig. A) was taken off New Zealand, station 169, 700 fathoms; off the Kermadecs, station 170A, 630 fathoms, and station 171, 600 fathoms; and off Japan, station 232, 345 fathoms; south of Japan, station 235, 565 fathoms; and also by the *Investigator* in the Gulf of Manaar, in 597 fathoms.

Cœlorhynchus quadricristatus, Alcock (Ann. and Mag. Nat. Hist., 1891, VIII, 119, Ill. Zoöl. *Investigator*, I, pl. III, fig. 1) from the Indian Ocean, station 118, 405 fathoms.

Cœlorhynchus scaphopsis, Gilbert (Proc. U. S. Nat. Mus. XIII, 1890, 115,) was taken by the *Albatross* off the coast of California in 145 fathoms.

CŒLORHYNCHUS ATLANTICUS, (LOWE), GOODE and BEAN.

Cœlorhynchus (*Cœlorhinque La Ville*) GIORNA, Mem. Accad. Imp. Turin, XVI, 1803, 178, pl. I, figs. 3–4.

Lepidoleprus cœlorhynchus, RISSO, Ichth. Nice, 1810, 200, pl. VII, fig. 22; Poissons Europe Meridionale, III, 1825, 244.

Macrourus cœlorhynchus, COSTA, Fauna Nap., 1829–'34, pl. XXXIX.—BONAPARTE, Fauna Italica, Pesci, 1832–'41 (with figure under name *M. mysticetus*); Cat. Metod., 1844, 41.—CANESTRINI, Arch. Zoöl. Anat., II, 1862, 373; Fauna Italica, Pesci, 159.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 392.—VINCIGUERRA, Ann. Mus. Curco, Genoa, XIV, 1879, 619 (II).—VAILLANT, Exp. Scient. Travailleur et. Talisman, 247, pl. XXI, fig. 3 (scales).— COLLETT, Bull. Soc. Zoöl. France, XV, 1890, 223.

Macrurus (*Cœlorhynchus*) *cœlorhynchus*, GÜNTHER, Challenger Report, XXII, 1887, 128.

Oxycephas cœlorhynchus, SWAINSON, *op. cit.*, 261.

Macrurus atlanticus, LOWE, Proc. Zoöl. Soc. London, 1839, 88.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 392.

Macrurus rupestris, LOWE, Synopsis Mad. Fish., 190.

Krohnius filamentosus, COCCO.—EMERY, Atti. Soc. Ital. Scienze Nat., XXI, 37 (larval form).

Günther's revised description is as follows:

Snout moderately produced, angular in front, a little shorter than or equal to the eye, the diameter of which is one-third of the length of the head. *Scales* of moderate size, covered with minute spines, giving a granular appearance to their surface. There are five or six scales in a transverse series, between the first dorsal fin and the lateral line. (A naked space between the ventrals.) Dorsal spine smooth. Abdomen, that is, distance of the vent from the isthmus, equal to the length of the head without snout in specimens about 12 inches long. Outer ventral ray produced into a short filament.

Radial formula: D. 10; A. 75–86; P. 20; V. 7.

This species is very closely related to *Macrurus carminatus*, Goode. It was originally described from a specimen in the Turin Museum, probably collected by Donati on his

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[1] "*Praya*" or *Lagartixa do mar.*"—*M. fusco-cinereus, dorso vinoso, gatturis umbilico pinnisque ventralibus atris: squamis-scaberrimus, echinalatis, ecarinatis, inermibus: oculis maximis.* (*Lowe.*)

expedition to Egypt and Arabia. It is known from the Gulf of Genoa, the sea of Nice (Risso), and about Sicily (Bonaparte and Döderlein); and Gasco observed two from the Gulf of Naples. Vaillant records it in 411-560 meters, from the Azores, and Cape Verdes, from off Soudan, the Banc d'Arguin, and the Gulf of Gascony. Collett obtained it from off Bergen, in the stomach of a codfish, and numerous specimens have been taken off the coast of Ireland in 250 fathoms. (Günther, Ann. and Mag. Nat. Hist., Dec., 1889, 417.) Vinciguerra (*loc. cit.*, 619) thoroughly reviews its history.

CŒLORHYNCHUS CARMINATUS, GOODE. (Figure 336.)

Macrurus carminatus, GOODE, Proc. U. S. Nat. Mus., III, 1880, 346, 475.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 196.

Macrurus (Cœlorhynchus) carminatus, GÜNTHER, Challenger Report, XXII, 129, pl. v, fig. 13.

The body is less elongate and stouter than in *M. Bairdii*, Goode and Bean, though its greatest height (12.5) is, as in *M. Bairdii*, one-eighth of total length. The difference in general appearance is the ventral contour retreats less rapidly in *M. carminatus*.

The scales are large, heavy, the free portions covered with long vitreous spines arranged in 9 or 10 rows. These scales resemble the old-fashioned wool cards. Hence the specific name, from *carmen*, a wool card. The spines are thicker and more closely set than in *M. Bairdii*, and there is no specialization of the central row. The number of scales in the lateral line can not be determined, though it probably does not exceed 100, but there are about 5 transverse rows above it and 15 or 16 below it, counting from the vent obliquely backward. In *M. Bairdii* there are 152 in the lateral line, 6 above and 19 or 20 below.

Length of head contained a little less than 5 times in total length. Width of interorbital area about equal to vertical diameter of orbit, and about one-fifth of the length of the head. Length of snout, horizontal diameter of eye, length of postorbital portion of head about equal. Length of operculum half that of snout.

Snout long, sharp, depressed, triangular, the lower surface more nearly parallel with the axis of the body than in *M. Bairdii.* The lateral ridges are pronounced and are contained in a straight line under the eyes and upon the preopercula. Strong horizontal ridges continue from the supraorbital margins to the gill-openings, parallel with the subocular ridges. Nostrils immediately in front of the orbit. Barbel very short.

Teeth small, conical, somewhat recurved, arranged in villiform bands.

Distance of first dorsal from snout (23.5) about 4½ times the length of its base (5), its distance from anterior margin of orbit much less than the length of the head. First spine very short, hardly perceptible above the skin. Second spine about half as long (11) as the head, slender, unarmed. When laid back, its tip reaches the origin of the second dorsal or beyond. The decrease in the length of the spines is very gradual, the sixth being nearly as long as the second, so that the fin is not so triangular in shape as in *M. Bairdii.*

The second dorsal begins in the perpendicular from the seventh ray of the anal. The anal is much higher than in *M. Bairdii*, nearly equal to half the width of the interorbital area.

Anal fin inserted under the eighteenth scale of the lateral line (as nearly as can be judged from the distorted specimen). It longest rays are as long as the width of the interorbital area.

Distance of pectoral from snout equal to twice its own length (11), which is about equal to the length of the dorsal spine. Its insertion is below the middle of the depth of the body and below the level of the center of the orbit. Its tip does not reach to the perpendicular from the origin of the anal.

Insertion of ventral behind pectoral and slightly in advance of the insertion of the dorsal. Its distance from the snout (22) is greater than twice its length (9). Its long filament does not reach to the origin of the anal fin.

Radial formula: D. 11, 80 +; A. 76 +; P. 13; V. 7.

Color, silvery gray. The thick, closely-set spines are matted with oozy mud which can not be removed. This is doubtless the result of the hard usage experienced in the trawl net.

Current number of specimen	26,007.	
Locality	871.	
	Milli-meters.	100ths of length.
Extreme length	248	100
Body: Greatest height under dorsal		12.5
Head:		
Greatest length		21
Width of interorbital area		4
Length of snout		7
Length of operculum		3.5
Length of mandible		7.25
Diameter of orbit		7
Dorsal (spinous):		
Distance from snout		23.5
Length of base		5
Height at first spine		11
Dorsal (soft): Distance from snout		35
Anal: Distance from snout		27
Pectoral:		
Distance from snout		21
Length		11
Ventral:		
Distance from snout		22
Length		10
Dorsal		I, IX, 80+
Anal		76+
Pectoral		13
Ventral		7
Number of scales in lateral line		|100|
Number of transverse rows above lateral line		(6)
Number of transverse rows below lateral line		(18)

The type specimen (Cat. No. 26007, U. S. N. M.), 248 millimeters in length, was taken by the *Fish Hawk* September 4, at station 871, in 40° 02′ 54″ N. lat., 70° 23′ 40″ W. lon., at a depth of 115 fathoms. It is very similar to Lowe's *Macrurus atlanticus*, and but for Günther's opinion that they are distinct, on account of the larger spines on the scales, we should have placed our specimens in that species.

Numerous specimens have been obtained by the American vessels from 115 to 464 fathoms, and the *Challenger* also collected it from the depths near the Bahamas. The *Blake* secured examples from station CCCXXI, in 32° 43′ 25″ N. lat, 77° 20′ 30″ W. lon., at a depth of 233 fathoms; from station CCCXXVI, in 33° 42′ 15″ N. lat., 76° 00′ 50″ W. lon., at a depth of 464 fathoms; from station CCV, in 24° 08′ N. lat., 82° 51′ W. lon., at a depth of 339 fathoms; from station LXXV off Barbados, at a depth of 180 fathoms; from stations CCLXIX and CCLXXIII; and from station LXXIV, off Barbados, at a depth of 180 fathoms.

Specimens were taken by the *Albatross* as follows: Cat. No. 32807, U. S. N. M., from station 2014, in 36° 41′ 05″ N. lat., 74° 38′ 55″ W. lon., at a depth of 373 fathoms; Cat. No. 35476, U. S. N. M., from station 2183, in 39° 57′ 45″ N. lat., 70° 56′ 30″ W. lon., at a depth of 195 fathoms; Cat. No. 35478, U. S. N. M., from station 2200, in 39° 53′ 30″ N. lat., 69° 43′ 20″ W. lon., at a depth of 148 fathoms; Cat. No. 35686, U. S. N. M., from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms; Cat. No. 33543, U. S. N. M., from station 2089, in 39° 58′ 50″ N. lat., 70° 39′ 40″ W. lon., at a depth of 168 fathoms; Cat. No. 33512, U. S. N. M., from station 2092, in 39° 58′ 35″ N. lat., 71° 00′ 30″ W. lon., at a depth of 197 fathoms; from station 2548, in 39° 56′ N. lat., 70° 14′ 30″ W. lon., at a depth of 200 fathoms; from station 2020, in 37° 37′ 50″ N. lat., 74° 15′ 30″ W. lon., at a depth of 143 fathoms; from station 2377, in 29° 07′ 30″ N. lat., 88° 08′ W. lon., at a depth of 210 fathoms; from station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon., at a depth of 280 fathoms; from station 2426, in 36° 01′ 30″ N. lat., 74° 47′ 30″ W. lon., at a depth of 93 fathoms; from station 2396, in 28° 34′ N. lat., 86° 48′ W. lon., at a depth of 335 fathoms; from station 2545, in 40° 01′ N. lat., 70° 23′ 45″ W. lon., at a depth of 142 fathoms; from station 2398, in 28° 45′ N. lat., 86° 26′ W. lon., at a depth of 227 fathoms; from station 2546, in 39° 56′ N. lat., 70° 14′ 30″ W. lon., at a depth of 200 fathoms; from station 2310, in 35° 44′ N. lat., 74° 51′ W. lon., at a depth of 132 fathoms; from station 2426, in 36 °01′ 30″ N. lat., 74° 47′ 30″ W. lon., at a depth of 93 fathoms; from station 2424, in 36° 41′ 37″ N. lat., 74° 42′ 15″ W. lon., at a depth of 85 fathoms; from station 2297, in 35° 38′ N. lat., 74° 53′ W. lon., at a depth of 49 fathoms; from station 2125, in 11° 43′ N. lat., 69° 09′ 30″ W. lon., at a depth of 208 fathoms; from station 2395, in 28° 36′ 15″ N. lat., 86° 50′ W. lon., at a depth of 347 fathoms; and from station 2264, in 37° 07′ 50″ N. lat., 74° 34′ 20″ W. lon., at a depth of 167 fathoms.

Examples were also taken by the ***Fish Hawk*** from the following localities: Cat. Nos. 26188 and 26197, U. S. N. M., from station 895, in 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., at a depth of 238 fathoms; Cat. No. 26001, U. S. N. M., from station 870, in 40° 02′ 36″ N. lat., 70° 22′ 58″ W. lon., at a depth of 155 fathoms; Cat. No. 28753, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; Cat. No. 28807, U. S. N. M., from station 945, in 39° 58′ N. lat., 71° 13′ W. lon., at a depth of 207 fathoms; Cat. No. 31775, U. S. N. M., from station 1138, in 39° 39′ N. lat., 71° 54′ W. lon., at a depth of 168 fathoms; Cat. No. 26192, U. S. N. M., from station 875, in 39° 57′ N. lat., 70° 57′ 30″ W. lon., at a depth of 126 fathoms; Cat. No. 29054, U. S. N. M., from station 1046, in 38° 33′ N. lat., 73° 18′ W. lon., at a depth of 104 fathoms; Cat. No. 26718, U. S. N. M., from station 897, in in 37° 25′ N. lat., 74° 18′ W. lon., at a depth of 157½ fathoms; Cat. No. 29048, U. S. N. M., from station 1045, in 38° 35′ N. lat., 73° 13′ W. lon., at a depth of 312 fathoms; Cat. 31875, U. S. N. M., from station 1151, in 39° 58′ 30″ N. lat., 70° 37′ W. lon., at a depth of 125 fathoms; Cat. No. 28958, U. S. N. M., from station 1032, in 39° 56′ N. lat., 69° 22′ W. lon., at a depth of 208 fathoms; Cat. No. 28891, U. S. N. M., from station 1026, in 39° 50′ 30″ N. lat., 71° 23′ W. lon., at a depth of 182 fathoms; and from station 879 in 39° 49′ 30″ N. lat., 70° 54″ W. lon., at a depth of 225 fathoms.

CŒLORHYNCHUS OCCA, GOODE and BEAN. (Figures 332, 333, 337.)

Macrurus occa, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 595.—GÜNTHER, Challenger Report, XXII, 124 note 5.

A species with an exceedingly elongate snout, nearly twice as long as the eye, with a black flap between the nostrils; with the angle of the mouth nearly reaching to the vertical from the posterior margin of the orbit; the head contained 3½ times in total length and equaling twice the greatest height of body. The ridge of the head is very strong and continuous from the snout to the angle of the preopercle, having, also, strong supraocular and occipital ridges.

Eye nearly round, its horizontal diameter ¼ length of the head and equal to interorbital space.

The ventral originates under the middle of the first dorsal, and extends to the fourth ray of the anal. The distance from ventral origin to vent is contained 3½ times in length of head.

The second spine of the dorsal is weak and smooth, its length equal to postorbital part of head, its base slightly less than the distance between first and second dorsals.

Squamation excessively rough, each scale bearing about 5 large spines besides many smaller ones, the median spine of the large series being much the largest. Five rows of scales between origin of dorsal and lateral line, 19 from vent forward to lateral line and 12 backward.

Barbel one-fourth as long as snout.

M. occa appears to be a near relative of *C. atlanticus*, and is very close also to *M. japonicus* of Vaillant (Exp. Sci. Travailleur et Talisman, Poissons, 254, pl. XXI, fig. 1), identified by him, without adequate grounds, with *M. japonicus*, Schlegel.

This species has scales similar to those of *Macrurus Fabricii*, there being a strong median keel formed by a series of 3 to 5 spines, of which the last is the largest. The surface of each scale also contains about 4 or more lateral ridges formed by series of short spines. In a much larger example, No. 37334, measuring 18 inches in length, the lateral series of keels have greatly increased in number, the individual spines have become more prominent, so that the median keel has become less conspicuous than in the type. In the larger specimen referred to the nakedness of the under surface of the head is even more pronounced than in the smaller, in which the under surface of the head beneath the suborbital and nasal ridge is almost entirely naked. The intermaxilla has a very short bone similar in structure and dentition to that of *Macrurus Fabricii*, that is to say, the intermaxillary teeth are in a rather broad villiform band, and the outer teeth are not enlarged. The mandibulary teeth are in a similar broad villiform band. The mouth is entirely inferior and small. The gill membranes are attached across the isthmus and are very little emarginate and not deeply cleft. In the large example the gill membrane is attached to the isthmus and not deeply cleft, but there is a very narrow free margin behind.

The gill rakers are very short, tubercular, and few in number, certainly not more numerous than in *Fabricii*. In the large example only 8 little tubercles can be seen on the first gill arch.

Second spine of the dorsal in the type specimen is smooth, with the exception of two weak spines near its tip, but in the large example there is no trace of serrations on the dorsal spine.

The type specimen (Cat. No. 37334, U. S. N. M.), 450 millimeters in length, was taken by the *Albatross* from station 2396, in 28° 34′ N. lat., 86° 48′ W. lon., at a depth of 335 fathoms.

CŒLORHYNCHUS CARIBBÆUS, GOODE and BEAN (Figure 338).

Macrurus caribbæus, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 594.—GÜNTHER, Challenger Report, XXII, 124, note 3.

A *Cœlorhynchus*, in general appearance resembling *M. carminatus*, from which it may be quickly distinguished by its sharper and longer snout, smaller scales, more advanced second dorsal, and many less prominent characters. The body is normal in shape, its greatest height (44 millimeters in the type specimen) contained 6½ times in its total length. Scales moderate, strong, densely covered with minute spines, without enlarged median keel, as in *Macrurus fabricii*; 124 in the lateral line, 6 series between origin of dorsal and lateral line, and 15 or 16 series from vent forward to lateral line. The length of the head (67 millimeters) is contained nearly 4½ times in the total length; interorbital area flat, its greatest width (13 millimeters) about 5 times in the length of the head. Postorbital portion of head (21 millimeters) contained about 3 times in its own length, and just as long as the eye, which is oval (its horizontal diameter 21 millimeters), and 1⅖ as long as its vertical diameter (15 millimeters). Snout long, thin, diaphanous, with acuminate point, its general form resembling that of *M. carminatus*. The nostrils are close to the orbit, the posterior ones much the largest. Teeth in both jaws in villiform bands, minute. Barbel slender and short, its length (7 millimeters) one-third that of the eye. The maxillary extends to the vertical through the middle of the pupil. Length of upper jaw (19 millimeters) slightly more than 3 times in length of head. Length of mandible (26 millimeters) contained 2½ times in length of head. The intermaxillary is a short bone as compared with the maxillary. The outer series of teeth in this bone and the mandible not enlarged, and the teeth not becoming uniserial. The gill-membrane is narrowly attached to the isthmus. Gill-rakers minute, tubercular, about 10 on the first arch. The suborbital ridge is very strong, and is continued almost in a straight line by the lateral ridge of the snout. The under surface of the head, except the chin and branchiostegal region, is densely covered with small, spiny tubercles. There is a naked space on the under surface of the snout; it occupies almost the entire distance from the front of the mouth to the tip of the snout; the space is widest anteriorly, but its greatest width is only about one-fifth the length of the snout. The intermaxillary is protractile in a nearly vertical direction, and the mouth is distinctly inferior and not lateral.

First dorsal with 2 spines—the first minute, the second smooth, elongate—and 8 rays, the last double, inserted at a distance from the snout (72 millimeters) equal to one-fourth of the total length; the second spine (39 millimeters long) reaching the fifth ray of the second dorsal. The length of its base (15 millimeters) equal to three-quarters of the space between the two dorsals. The second dorsal begins in the perpendicular from the seventh ray of the anal, and at a distance from the first dorsal (20 millimeters) about equal to the diameter of the eye. The longest rays are not as long as the barbel. It contains at least 110 rays. The anal is inserted under the interspace between the two dorsals; its height is equal to one-fourth the length of the head. It contains at least 110 rays. The pectoral is inserted in advance of the origin of the first dorsal, its length (33 millimeters) half that of the head. Its tip extends to the vertical from the fifth anal ray, and to about the seventeenth scale of the lateral line. The ventral originates under the second spine of the dorsal, its outer ray somewhat produced, extending slightly beyond the origin of the anal. The distance of the vent from the origin of the ventral equals the length of the eye.

Color, silvery gray, with yellowish and lavender tints.

Many specimens were obtained by the *Albatross*. The type is selected from a number obtained at station 2377, in the northern part of the Gulf of Mexico, 29° 07′ 30″ N. lat., 88° 08′ W. lon., at a depth of 210 fathoms. Its length is 290 millimeters. Others were obtained from station 2143, in 9° 30′ 45″ N. lat., 76° 25′ 30″ W., lon., at a depth of 155 fathoms; from station 2400, in 28° 41′ N. lat., 86° 07′ W. lon., at a depth of 169 fathoms; and from station 2401, in 28° 38′ 30″ N. lat., 85° 52′ 30″ W. lon., at a depth of 142 fathoms.

CŒLORHYNCHUS FASCIATUS, (Günther), Goode and Bean.

Macrurus fasciatus, Günther, Ann. and Mag. Nat. Hist., 1878, II, 24; Challenger Report, XXII, 129, pl. XXVII, Fig. A.

Snout not much produced, shorter than the eye, which is very large, two-fifths of the length of the head, its vertical diameter being considerably more than the width of the interorbital space. Scales with from 8 to 10 subparallel keels. Upper and lateral portions of the head covered with small rough scales, lower naked. There are four scales in a transverse series between the first dorsal spine and lateral line; distance between the two dorsal fins equal to the length of the base of the first. Anterior dorsal spine smooth. Outer ventral ray produced into a filament. Distance between the vent and isthmus shorter than the head without snout. Barbel small. Whitish, with broad, irregular, blackish bands across the back.

Radial formula: D. 12; A. 62; P. 15; V. 7. (*Günther.*)

The *Challenger* obtained it from stations 305A, 309, 309A, and 311, on the east coast of the southern extremity of South America, at depths of 125, 40, 140, and 245 fathoms, respectively.

The species is closely allied to *Macrurus australis*, but has (1) a narrower forehead, (2) a larger eye, and (3) fewer keels on the scales. In the smaller and younger specimens the keels are fewer in number (5 to 6) and have a more divergent direction than in the largest example.

CORYPHÆNOIDES, Gunner.

Coryphænoides, Gunner, Trondhj. Selsk. Skrift., III, 50, pl. III, fig. 1 (type, *C. rupestris*, Gunner).
Coryphænoides (as subgenus), Günther, Challenger Report, XXII, 1887, 124.

A genus with general characters of *Macrurus*, but with teeth in villiform bands above and below, imbricate and spinigerous scales, mouth wide and lateral; snout short, oblique, truncated; barbel very small; anterior dorsal spine finely barbed; outer ventral ray filamentous.

In addition to the Atlantic forms, *C. altipinnis*, Günther (Challenger Report, XXII, 138, pl. XXXIX), was taken off Japan at depths of from 565 to 1,875 fathoms.

CORYPHÆNOIDES RUPESTRIS, Gunner.

Coryphænoides rupestris, Gunnerus, Trondh. Selsk. Skrift., III, 1765, 50, Pl. III, fig 1.—Collett, Norges Fiske, 131.—Goode and Bean, Bull. Mus. Comp. Zool., 1883, X, No. 5, 197.

Macrurus (*Coryphænoides*) *rupestris*, Günther, Challenger Report, XXII, 1887, 138.

Macrurus norwegicus, Nilsson, Skand. Fauna, Fisk., 600.

Macrurus Strömii, Reinhardt, K. Dansk. Vidensk. Selsk. Afhandl., VII, 129.—Gaimard, Voyage Skand. Poissons, pl. XI (magnificent figure).

Head short, rather compressed; snout short, obliquely truncated in front; cleft of the mouth wide, lateral, extending to beyond the center of the eye; intermaxillary not much shorter than the maxillary. Teeth in villiform bands in both jaws; barbel very small. Interorbital space convex, its width being considerably more than the diameter of the eye, which in a specimen 3 feet long is equal to the length of the snout and one-fourth of that of the head. The *scales* are equally rough over the whole of their surface, all the spinelets being directed backwards; there are 7 or 8 scales in a transverse series between the dorsal fin and the lateral line. Head entirely covered with small scales. Anterior dorsal spine armed with numerous small closely-set barbs; outer ventral ray produced into a long filament. Distance between the vent and isthmus two-thirds of the length of the head.

Radial formula: D. 10; P. 19; V. 7. (*Günther.*)

Coryphænoides rupestris has 4 + 15 gill-rakers (= 19). The gill membrane is entirely free from the isthmus behind. The intermaxilla is continued beyond its vertical process and extends almost as far back as the maxilla, these two bones being about equal in length. The last third of the intermaxilla is toothless. The intermaxillary teeth are in a very narrow band, which is uniform in width, and the outer teeth are only slightly enlarged. The mandible has villiform teeth in a broad bunch-like band at the symphysis and becoming uniserial behind. The eye is nearly circular. The snout projects slightly. Gill-rakers longer and less tubercular in character than in *M. berglax* and *M. acrolepis*. The suborbital ridge is feebly developed and is very abruptly curved upward and narrowed in front of the eye where it joins the nasal ridge. In *M. berglax* and *M. acrolepis* the suborbital ridge is very strong and is continued almost in a straight line towards the nasal ridge.

Specimens of this fish were taken by the *Porcupine* and *Knight Errant* between Shetland and the Faröes in 200–500 fathoms. A single specimen was secured by the *Blake* from station CCCVI, in 41° 32′ 50″ N. lat., 65° 55′ W. lon., at a depth of 524 fathoms. The *Albatross* obtained examples from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; Cat. No. 35661, U. S. N. M., from station 2238, in 39° 06′ N. lat., 72° 10′ W. lon., at a depth of 904 fathoms; Cat. No. 32657, U. S. N. M., from station 2003, in 37° 16′ 30″ N. lat., 74° 20′ 36″ W. lon., at a depth of 641 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., at a depth of 571 fathoms; from station 2429, in 42° 55′ 30″ N. lat., 50° 51′ W. lon., at a depth of 471 fathoms; from station 2078, in 41° 11′ 30″ N. lat., 66° 12′ 20″ W. lon., at a depth of 499 fathoms; Cat. No. 35568, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; from station 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., at a depth of 677 fathoms; and from station 2554, in 39° 48′ 30″ N. lat., 70° 40′ 30″ W. lon., at a depth of 445 fathoms; The *Fish Hawk* from station 1155, in 39° 52′ N. lat., 70 30′ W. lon., at a depth of 554 fathoms; and Cat. No. 28943, U. S. N. M., from station 1020, in 39° 57′ 05″ N. lat., 69° 16′ W. lon., at a depth of 458 fathoms. A single individual (Cat. 26347, U. S. N. M.) was captured by the schooner *G. P. Whitman* off the southern part of Banquereau.

CORYPHÆNOIDES SULCATUS, GOODE and BEAN.

Coryphænoides sulcatus, GOODE and BEAN, Proc. U. S. Nat. Mus., 1888, 596.
Trachonurus sulcatus, GOODE and BEAN, Oceanic Ichthyology, 1893, 410.

The body is elongate, rapidly contracted behind the abdomen, the tail long and whip-like; greatest hight of body (25 millimeters) 9½ times in total length.

Scales moderate, strongly armed, each with 8–10 spinelets irregularly placed, the spinelets less numerous in the young, which feel bristly to the touch, separated by wide deep furrows (hence the specific name). More than 175 in the lateral line. Between origin of dorsal fin and lateral line 7; counting from the origin of the lateral line the number of scales in a distance equal to length of head is 33.

Armature of head similar to that of body, but the scales upon the snout, cheeks, and chin have very feeble spines. Length of head (32 millimeters) 7½ times in total length.

Interorbital area nearly flat, its length (10 millimeters) equal to diameter of eye, and a little less than one-third length of head. Postorbital portion of head (15 millimeters) 1½ times as long as diameter of eye. Eye circular, in larger individual its diameter less than width of interorbital space, 3⅔ times in length of head. Snout short, obtuse, scarcely overhanging the mouth, its length (7 millimeters) 4½ times in that of head; in the larger individual it is 4⅓ times in length of head.

Nostrils somewhat above level of middle of eye, the anterior one nearly upon the dorsal outline.

Teeth in upper jaw in two series, the outer series somewhat enlarged; in lower jaw in a single series.

The end of the maxilla reaches to the vertical through the hind margin of pupil in the large specimen, to that through the front margin of the same in the type. Length of upper jaw, including maxilla (11 millimeters), about 3 times in length of head. Length of mandible (13 millimeters) equal to one-half the height of the body. Barbel (4 millimeters) 2½ times in diameter of eye; in the large specimen it is half as long as the eye.

Gill-rakers rudimentary; the attachment of the membrane to the first arch is very extensive. Pseudobranchiæ absent.

First dorsal comparatively low, composed of 2 spines, the first rudimentary, the second elongate, smooth, and with 8–9 rays. Its insertion is immediately over that of the pectoral; its distance from the snout (36 millimeters) equals 1½ times the length of the head; its length of base (7 millimeters) equal to length of snout. Its longest spine, when laid backward, reaches beyond origin of second dorsal, its length (15 millimeters) one-half to two-thirds that of the head.

Second dorsal very low; its distance from first dorsal equal to one-third length of head; in the type about one-fourth.

Anal much higher than second dorsal, yet very low, its longest ray equal in length to diameter of eye; its distance from snout (51 millimeters) 4⅔ times in total length, its origin being nearly under that of the second dorsal.

Pectoral inserted under origin of first dorsal, its length about one-half that of head.

Ventral inserted behind the vertical from the end of the base of the first dorsal in the type. In the mutilated larger specimen it appears to be under the posterior ray of the first dorsal. The ventral extends to the origin of the anal, its length (10 millimeters) equaling diameter of eye; in large specimen 1¼ diameter of eye. Vent about midway between origin of ventrals and anal.

Radial formula: D. II, 8–9; A. 120; V. 7; P. 13.

In a distance equal to length of head 32 rays were counted in the dorsal fin; in the anal fin 22.

Color brown, abdomen and lower part of head in young blackish.

The type of this species, 37335, is an individual 238 millimeters long, taken at Albatross station 2394, with a large specimen (about 350 millimeters) badly mutilated, from *Blake* station LXXIII, off Martinique, 472 fathoms, as a collateral type. (See page 409, below.)

CORYPHÆNOIDES CARAPINUS, GOODE and BEAN. (Figure 339.)

Coryphænoides carapinus, GOODE AND BEAN, Bull. Mus. Comp. Zool., 1883, X, No. 5, 195–198.—GÜNTHER, Challenger Report, XXII, 1887, 139.

The snout is acute, projecting beyond the mouth, its tip at a distance from the mouth equal to or greater than the diameter of the eye. The bones of the head are very soft and flexible, and its surface is very irregular, there being a very prominent subocular ridge, a prominent ridge extending from the tip of the snout to the middle of the interorbital space, and a curved ridge extending from the upper anterior margin of the orbit over the cavity containing the nostrils to a prominent point at the side of and slightly posterior to the tip of the snout. The barbel is two-thirds as long as the eye. The eye is contained in the head 4 times, and the length of the head in the total length 6 times.

The interorbital space is almost twice the diameter of the eye, and is equal to the length of the upper jaw. The preoperculum is crenulate.

The upper jaw extends to the vertical through the posterior margin of the pupil; its length equals half that of the head without the snout. The mandible extends behind the vertical through the posterior margin of the orbit; its length is contained 3 times in the distance from the tip of the snout to the origin of the first dorsal. The teeth are in villiform bands in intermaxillary and mandible; the mandibulary series uniserial in about the second half of its length.

The first ray of the dorsal is very short; the second compressed anteriorly and serrated, with slender teeth closely appressed and bent upwards. Its length is equal to the length of the head and is greater than the height of the body. This fin is seated upon a humplike elevation of the back, and its base is as long as the snout. The second dorsal begins over the tenth or twelfth anal ray, and at a distance from the end of the first dorsal equal to the length of the head without the snout. The vent is located not far behind the vertical from the end of the first dorsal.

Scales 22 to 24 in a transverse series (the position of the lateral line can not be determined, but there appear to be 4 above it); the scales are oval, membranaceous, showing several parallel ridges composed of small spines and rather large. Gill membrane very deeply cleft and attached to the isthmus. Gill-rakers short and stout, about 11 below the angle on the first arch.

Radial formula: D. II, 8+100; A. 117; V. 10.

The *Blake* secured specimens from station CCCVIII, in 41° 24′ 45″ N. lat., 65° 35′ 30″ W. lon., at a depth of 1,242 fathoms; from station CCCXLI, in 39° 38′ 20″ N. lat., 70° 56′ W. lon., at a depth of 1,241 fathoms; from station CCCXXXVIII, in 38° 18′ 40″ N. lat., 73° 18′ 10″ W. lon., at a depth of 922 fathoms; and from station CCCXLII, in 39° 43′ N. lat., 70° 55′ 25″ W. lon., at a depth of 1,002 fathoms. Most of these had their tails broken off, and all of them were completely denuded of scales; a natural consequence of their passage in the nets from the ocean depths. By a happy chance two scales were found attached to the base of the dorsal fin of one of the larger individuals, thus enabling us to determine the general character of the covering of the body.

The *Albatross* obtained examples from the following localities: Cat. No. 33273, U. S. N. M., from station 2035, in 39° 26′ 16″ N. lat., 70° 02′ 37″ W. lon., at a depth of 1,362 fathoms; Cat. No. 33314, U. S. N. M., from station 2052, in 39° 40′ 05″ N. lat., 69° 21′ 25″ W. lon., at a depth of 1,098 fathoms; Cat. No. 33566, U. S. N. M., from station 2096, in 39° 22′ 20″ N. lat., 70° 52′ 20″ W. lon., at a depth of 1,451 fathoms; Cat. Nos. 33307 and 33315, U. S. N. M., from station 2051, in 39° 41′ N. lat., 69° 20′ 20″ W. lon., at a depth of 1,106 fathoms; Cat. Nos. 33395 and 33413, U. S. N. M., from station 2074, in 41° 43′ N. lat., 65° 21′ 50″ W. long., at a depth of 1,309 fathoms; Cat. No. 33308, U. S. N. M., from station 2052, in 39° 40′ 05″ N. lat., 69° 21′ 25″ W. lon., at a depth of 1,098 fathoms; Cat. No. 35480, U. S. N. M., from station 2196, in 39° 35″ N. lat., 69° 44″ W. lon., at a depth of 1,230 fathoms; Cat. No. 33583, U. S. N. M., from station 2095, in 39° 29″ N. lat., 70° 58′ 40″ W. lon., at a depth of 1,342 fathoms; Cat. No. 35516, U. S. N. M., from station 2205, in 39° 35′ N. lat., 71° 18′ 45″ W. lon., at a depth of 1,073 fathoms; Cat. No. 45413, U. S. N. M., from station 2182, in 39° 25′ 30″ N. lat., 71° 44″ W. lon., at a depth of 861 fathoms; Cat. No. 33437, U. S. N. M., from station 2084, in 40° 16′ 50″ N. lat., 67° 05′ 15″ W. lon., at a depth of 1,290 fathoms; Cat. No. 33376, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 33505, U. S. N. M., from station 2194, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1,022 fathoms; Cat. No. 35466, U. S. N. M., from station 2195, in 39° 44′ N. lat., 70° 03′ W. lon., at a depth of 1,058 fathoms; Cat. No. 35470, U. S. N. M., from station 2562, in 39° 15′ 30″ N. lat., 71° 23′ W. lon., at a depth of 1,434 fathoms; Cat. No. 33518, U. S. N. M., from station 2094, in 39° 44′ 30″ N. lat., 71° 04′ W. lon., at a depth of 1,022 fathoms; Cat. No. 35532, U. S. N. M., from station 2008, in 39° 33′ N. lat., 71° 16′ 15″ W. lon., at a depth of 1178 fathoms; from station 2564, in 29° 22′ N· lat., 71° 23′ 30″ W. lon., at a depth of 1,390 fathoms; from station 2550, in 39° 44′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 1,081 fathoms; from station 2533, in 40° 16′ 30″ N. lat., 67° 26′ 15″ W. lon., at a depth of 828 fathoms; from station 2532, in 40° 34′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; from station 2530, in 40° 53′ 30″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; from station 2103, in 38° 47′ 20″ N. lat., 72° 37′ W. lon., at a depth of 1,091 fathoms; from station 2102, in 38° 44″ N. lat., 72° 38′ W. lon., at a depth of 1,209 fathoms; from station 2116, in 35° 45′ 23″ N. lat., 74° 31′ 25″ W. lon., at a depth of 888 fathoms; from station 2529, in 41° 03′ 30″ N. lat., 66° 14′ W. lon., at a depth of 662 fathoms; and from station 2115, in 35° 49′ 30″ N. lat., 74° 34′ 45″ W. lon., at a depth of 843 fathoms.

HYMENOCEPHALUS, Giglioli.

Hymenocephalus, GIGLIOLI, Pelagos, Genoa, 1884, 228 (type, *H. italicus*, with recognizable figure.)—VAILLANT, Exp. Sci. Travailleur et Talisman, 210.

Mystaconurus (as subgenus), GÜNTHER, Challenger Report, XXII, 1887, 124.

Allied to *Coryphænoides*, with smooth dorsal spine, with first dorsal broad, placed far forward over base of pectoral; with second dorsal and anal origins nearly opposite, and separated by a considerable space from the vertical from the end of first dorsal; with vent far from ventral origin. Head large, naked, soft, and cavernous; snout abrupt, perpendicular or parabolic; mouth lateral, wide. Eye very large, orbital margin forming part of profile of head. Barbel long. Pectoral rather narrow (10–16 rays). Scales thin, deciduous, with fine short spines. Under parts in advance of ventral wholly or partly naked.

Hymenocephalus heterolepis (Alcock), occurs in the Andaman Sea, off Ross Island, in 205 to 271 fathoms, and in the Bay of Bengal, between Watts and South Sentinel Islands in 220 to 240 fathoms (Ann. and Mag. Nat. Hist. 1889, Nov., 396.), and in the Laccadive Sea, 188–220 fathoms. [Ill. Zoöl. *Investigator*, I, pl. III, fig. 30.]

H. longibarbis (Günther), was taken by the *Challenger* at Station 173, off Matuku, Fiji Islands, at the depth of 315 fathoms.

HYMENOCEPHALUS ITALICUS, GIGLIOLI.

Malacocephalus lævis, MOREAU (not Lowe), Hist. Nat. Poiss. France, 1881, III, 284, fig. 183.

Hymenocephalus italicus, GIGLIOLI, Pelagos, 228, 1884 (without description, but with fair woodcut).—VAILLANT, Exp. Scient. Travailleur et Talisman, 127, pl. XIX, fig. 1.

Macrurus (*Mystaconurus*) *italicus*, GÜNTHER, Challenger Report, XXII, 1887, 141.

Head deeper than broad, with vertical sides and wide muciferous cavities; snout obtuse, short, slightly projecting beyond the mouth, the cleft of which is oblique, anterior and lateral, and extending to behind the middle of the eye. Teeth in both jaws minute, of equal size, villiform, in narrow bands. Barbel small. Interorbital space as wide as the eye, the diameter of which is one-third of the length of the head, and exceeding the snout in length. Scales extremely thin, deciduous, spiny, of comparatively large size. Preopercular margin not serrated. Anterior dorsal spine smooth, filamentous; the distance between the two dorsal fins is but little more than the length of the base of the former. Pectoral fin about half as long as the head. Vent far behind first dorsal but close to the root of the ventral fins which reach it, and the outer ray of which is produced into a filament. Anal far back. A triangular scaleless space between the ventral fins, nearly extending to the vent; a small round naked space, surrounded by spiny scales, in the middle of the preventral region. Distance between the vent and the isthmus three-fourths of the length of the head. Body and tail colorless; sides of the head and abdomen silvery; lower parts to the vent black. (*Günther*.)

Radial formula: D. 12; P. 16; V. 10.

Günther, who examined a young specimen from Nice, 5½ inches long, says that there can be no doubt that this is a juvenile form, and that if it were not for the dentition he should not hesitate to refer it to *Macrurus lævis*, with which it agrees in several important characters. Moreau and Vaillant had no opportunity to examine larger specimens. The French expedition obtained 118 specimens at depths of 265 and 1,042 fathoms off the coast of Morocco.

HYMENOCEPHALUS GOODEI, (GÜNTHER), BEAN. (Figure 340.)

Macrurus asper, GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 1883, 196–7 (name preoccupied).—JORDAN, Cat. Fish. N. Amer., 1885, 131.
Macrurus Goodii, GUNTHER, Challenger Report, XXII, 1887, 136.
Hymenocephalus Goodei, BEAN, MS.

The relations of this species appear to be with *M. Bairdii*, from which it differs in (1) its longer snout, (2) the location of the vent, which is much farther back, and (3) the absence of keels upon any of its scales.

The length of the specimen described is 322 millimeters. The body is much stouter than in *M. Bairdii*, its greatest height being contained 6½ times in its length. The scales are small, strong, the free portions covered by series of small vitreous spines arranged in about six rows; there is no specialization of the central row, as in *M. Bairdii*, though the median spine at the margin of the scale projects most strongly and is longest, consisting of 7 or 8 spines. The number of scales in the lateral line is about the same, there being about 150; there are 7 above and 18 below the line.

Length of head contained 5⅔ times in total length. Width of interorbital area a little greater than horizontal diameter of orbit and length of operculum, and contained 4¼ times in the length of the head. Length of snout about equal to width of interorbital space and about one-half the postorbital portion of the head. Snout triangular, depressed, its tip in the axis of the body, and nearly on a level with the lower margin of the eye; its lower surface forming an angle with the body axis, about equal to that formed with same by its upper profile. The superior ridge is pronounced anteriorly, but ends in advance of the concavity in the interorbital space. The lateral ridges are prominent, and continue posteriorly to the eye, with strong angular projections in front of the nostrils. No ridges continued from supraorbital region. Nostrils rather close to the eye. Barbel shorter than the eye. Tip of lower jaw under anterior nostril; cleft of mouth under posterior margin of orbit. The under surface of the head is naked, with the exception of a few minute, spiny tubercles on the under surface of the mandible. The suborbital ridge is very slightly developed. The intermaxillary is a long bone, nearly as long as the maxillary, and the mouth is large. The teeth on the intermaxillary are in a double series, of which the outer contains much larger teeth than the inner. The teeth in the mandible are uniserial; the dorsal spine is strongly serrated.

Distance of first dorsal from snout equal to nearly 4 times the length of its base, its distance from the anterior margin of the orbit equal to the length of the head. First spine minute; second spine strongly serrated as in *M. Bairdii*, nearly two-thirds the length of the head, and when laid down is far from reaching to the origin of the second dorsal. When the fin is erect, its superior margin is nearly at right angles to the plane of the back, and slightly convex. The distance between the two dorsals is twice the length of the base of the first, the second beginning in the perpendicular from the fifth ray of the anal.

The anal is about 3 times as high as the second dorsal. The vent is under the thirtieth scale of the lateral line directly in advance of the anal, and at a distance from the ventral considerably greater than the length of that fin, in this respect differing widely from *M. Bairdii.*

Distance of pectoral from snout slightly more than the length of the head. Its length is less than that of the dorsal spine, and slightly more than half its distance from the snout. Its insertion (upper axil) is in the middle line of the body.

Insertion of ventral under that of pectoral, and slightly in advance of that of dorsal. Its first ray is not greatly prolonged, and is about half as long as the distance of the fin from the snout.

The branchiostegal membrane is narrowly attached to the isthmus, leaving no free margin behind. The gill-rakers are very small tubercles, and there are only ten below the angle on the first arch.

Radial formula: 1st D. II, 8–9; 2nd D. 105; A. 110; P. 20; V. 10; scales 7/150/18.

Color dark reddish brown, the spines upon the scales with a metallic luster. The young have 3 stellate bosses upon the snout, one at its tip, one at some distance upon each side.

This species belongs in the subgenus *Nematonurus* of Günther. It resembles *Macrurus affinis*, from which it differs in its smaller eye (one-fifth as long as the head), and in having the head contained 5⅜ times in the total length, instead of 5 times as in *affinis*.

The *Blake* secured specimens from station CCCVIII, in 41° 25′ 45″ N. lat., 65° 35′ 30″ W. lon., at a depth of 1,242 fathoms; from station CCCIX, in 40° 11′ 40″ N. lat., 68° 22′ W. lon., at a depth of 304 fathoms; and from station LXXVI, off Havana, at a depth of 154 fathoms. The *Albatross* also obtained examples from station 2564, in 39° 22′ N. lat., 71° 23′ 30″ W. lon., at a depth 1,390 fathoms; from station 2563, in 39° 18′ 30″ N. lat., 71° 23′ 30″ W. lon., at a depth of 1,422 fathoms; from station 2534, in 40° 01′ N. lat., 67° 29′ 15″ W. lon., at a depth of 1,234 fathoms; from station 2562, in 39° 15′ 30″ N. lat., 71° 25′ W. lon., at a depth of 1,434 fathoms; Cat. No. 33392, U. S. N. M., from station 2074, in 41° 43′ N. lat., 65° 21′ 50″ W. lon., at a depth of 1,309 fathoms; Cat. Nos. 33274 and 33276, U. S. N. M., from station 2035, in 39° 26′ 16″ N. lat., 70° 02′ 37″ W. lon., at a depth of 1,309 fathoms; Cat. No. 33302, U. S. N. M., from station 2041, in 39° 22′ 50″ N. lat., 68° 25′ W. lon., at a depth of 1,608 fathoms.

HYMENOCEPHALUS CAVERNOSUS, GOODE and BEAN. (Figure 341.)

Bathygadus cavernosus, GOODE and BEAN, Proc. U. S. Nat. Mus., 1885, 598.—GÜNTHER, Challenger Report, XXII, 1887, 156.

Body stoutish, its greatest height (23 millimeters) contained 7 times in total length.

The scales are moderate, deciduous, cycloid, with no visible armature, about 8 rows under the base of the first dorsal.

Length of head (28 millimeters) about 6 in total length. The bones of the head are very soft and cavernous, in many places without muscular covering, spongy. Interorbital area doubly concave with a spinous medial ridge; its greatest width (10 millimeters) about 2⅘ in the length of the head.

Postorbital portion of head (13 millimeters) about half its length, 1⅓ as long as eye, which is circular, its diameter (10 millimeters) contained 2⅘ times in the length of the head.

Snout broad, very obtuse, its width at nostril nearly equal to interorbital width, its length (6 millimeters) 4⅔ times in that of the head. Nostrils normal.

Teeth in both jaws in villiform bands, very small; a naked space at the symphysis of of the intermaxillary; vomer and palatine toothless. Gill-rakers very short, minute, and rather numerous; about 18 below the angle of the anterior arch. Pseudobranchiæ absent. Barbel two-fifths as long as the eye.

First dorsal composed of 2 spines, the first of which is minute, inserted at a distance from the snout (28 millimeters) equal to the length of the head; the second as long as the head without the snout, and 10 branched rays; its base (10 millimeters) equal to diameter of eye. Second dorsal almost rudimentary, its rays remarkably short, about 133 in number; its distance from the first dorsal half the length of head.

Anal much higher than second dorsal, its distance from the snout (46 millimeters) contained about 3½ times in the total length. About 27 rays in a space equal to length of head. Anterior rays longest, in length about three-fourths of the diameter of the eye.

Pectoral inserted under the first branched ray of the first dorsal, its length (20 millimeters) equal to twice that of the eye and about two-thirds length of head.

Ventral slightly behind the pectoral, its first ray filamentous, reaching to the base of the tenth anal ray; it consists of 11 rays.

Color, gray, with silvery tints on sides; the abdomen and lips dark.

Dr. Bean has reëxamined the types of *Bathygadus cavernosus*, and is convinced that Dr. Günther is probably right in his statement that it belongs to the subgenus *Mystaconurus*, but since the specimens are all young and have more rays in the ventral fin than the described species, it can not be referred to *M. longifilis*, and must be called for the present *Hymenocephalus cavernosus*.

The following revised data are presented: D. II, 10, 133; A. 27 rays in space equal to length of head; V. 11; P. 13; height 7 in total; head 6. Interorbital area 2⅛ in head, equal to eye. Snout 4⅜ in head. Teeth in villiform bands. Gill-rakers very short, minute, about 18 below the angle. No pseudobranchiæ. Barbel 2½ in eye.

The type, number 37337, is a young specimen, 162 millimeters long, obtained by the *Albatross* at station 2398, N. lat. 28° 45′, W. long. 86° 26′, at a depth of 227 fathoms.

LIONURUS, Günther.

Lionurus (as subgenus), GÜNTHER, Challenger Report, XXII, 121.

A genus resembling *Macrurus*, but with imbricated, smooth, and flaccid scales; soft, cavernous bones; small eye; filamentous ventral ray; minute barbel, and projecting, pointed snout. A characteristic bathybial type.

Günther's *Macrurus microlepis*, (*loc. cit.*) from off Matuku, Fiji Islands, 315 fathoms, is provisionally referred by him to this division, though based upon immature specimens.

Lionurus liolepis, Gilbert (Proc. U. S. Nat. Mus., XIII, 1890, 117), was taken by the *Albatross*, off the coast of California, in 693 fathoms.

LIONURUS FILICAUDA, GÜNTHER. (Figure 342.)

Coryphænoides (*Lionurus*) *filicauda*, GÜNTHER, Ann. and Mag. Nat. Hist., 1878; Challenger Report, XXII, 27, pl. XXXIV, fig. B.

Snout considerably projecting beyond the mouth, pointed in the middle; it is twice as long as the eye, which is unusually small, only half as wide as the interorbital space. Mouth rather wide, extending beyond the center of the eye. Upper teeth villiform, in a very narrow band, those of the mandible very small, biserial. Barbel minute. Præoperculum with the angle produced backwards, broadly rounded and crenulated on the margin. The terminal portion of the tail is prolonged into a long filament, more slender than in any of the other species. Bones of the head soft.

Scales of moderate size, thin, cycloid, and deciduous; six or seven in a transverse series between the first dorsal spine and the lateral line; snout and inferior half of the infraorbital region naked. The second dorsal spine slender, with the barbs in front very inconspicuous and sometimes entirely absent. The distance between the two dorsal fins is less than the length of the head. The outer ventral ray produced into a short filament. Distance between vent and isthmus less than the length of the head.

Head and trunk whitish, tail brownish, lower part of the head and gill-opening black. (*Günther.*)

Radial formula: D. 11; P. 20; V. 9; Cæc. pyl. 7.

The *Challenger* obtained this species from the Antarctic Ocean and from the deep sea on both sides of the South American Continent: from station 325, at a depth of 2,650 fathoms; from station 323, at a depth of 1,900 fathoms; from station 299, at a depth of 2,160 fathoms; from station 158, at a depth of 1,800 fathoms; from station 157, at a depth of 1,950 fathoms, and from station 146, at a depth of 1,375 fathoms.

Dr. Günther holds that this species is clearly one of those of the family which extend to the greatest depths, since the small eye, the soft bones, the lack of firmness in the scales, and the filamentous tail indicate its abyssal abode.

TRACHONURUS, Günther.

Trachonurus (as subgenus), GÜNTHER, Challenger Report, XXII, 1887, 124.

A genus resembling *Macrurus* in form and dentition, but with incomplete squamation, the skin being densely studded with erect spines, strongest at the bases of the vertical fins, space between the vent and ventral scaleless; snout short, compressed; interorbital ridge obsolete; mouth small, lateral.

In addition to the type species, *M. villosus*, Günther (Challenger Report, XXII, 142, pl. XXXVI, fig. B) from Japan, 345 fathoms, and the Philippines, 500 fathoms, our *Malacocephalus sulcatus* appears to belong to this group.

TRACHONURUS SULCATUS, GOODE and BEAN. (Figure 343.)

Coryphænoides sulcatus, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 596; Oceanic Ichthyology, 403.
Macrurus (Malacocephalus) sulcatus, GÜNTHER, Challenger Report, XXII, 1887, 169.

The type of this species, Cat. No. 37335, is an individual 238 millimeters long, taken at *Albatross* station 2394, in 420 fathoms, with a large specimen (about 350 millimeters) badly mutilated, from *Blake* station LXXIII, off Martinique, 472 fathoms, as a collateral type.

Body is elongate, rapidly contracted behind the abdomen, the tail long and whip-like; greatest height of body (25 millimeters) 9½ times in total length.

Scales moderate, strongly armed, each with 8–10 spinelets, irregularly placed, the spinelets less numerous in the young, which feel bristly to the touch, separated by wide, deep furrows (hence the specific name); more than 175 in the lateral line. Between origin of dorsal fin and lateral line 7; counting from the origin of the lateral line the number of scales in a distance equal to length of head is 33. Between the anal and vent 21–22 (counting forward from vent, 16 counting backward).

Armature of head similar to that of body, but the scales upon the snout, cheeks, and chin have very feeble spines.

Length of head (32 millimeters) 7½ times in total length.

Interorbital area nearly flat, its length (10 millimeters) equal to diameter of eye, and a little less than one-third length of head. Postorbital portion of head (15 millimeters) 1½ times as long as diameter of eye. Eye circular, in larger individual its diameter less than width of interorbital space, 3⅔ times in length of head. Snout short, obtuse, scarcely overhanging the mouth, its length (7 millimeters) 4½ times in that of head; in the larger individual it is 4⅓ times in length of head.

Nostrils somewhat above level of middle of eye, the anterior one nearly upon the dorsal outline.

Teeth, two series in upper jaw in villiform bands, in the outer series slightly enlarged; in lower jaw in a single series.

The end of the maxilla reaches to the vertical through the hind margin of pupil in the large specimen, to that through the front margin of the same in the type. Length of upper jaw, including maxilla (11 millimeters), about 3 times in length of head. Length of mandible (13 millimeters) equal to one-half the height of the body. Barbel (4 millimeters) 2½ times in diameter of eye; in the large specimen it is half as long as the eye.

Gill-rakers very small, tubercular, almost rudimentary, about 10 below angle of first arch; the attachment of the membrane to the first arch is very extensive, but the membranes are free from the isthmus. Pseudobranchiæ absent.

First dorsal comparatively low, composed of 2 spines, the first rudimentary, the second elongate and smooth, and 8–9 rays. Its insertion is immediately over that of the pectoral; its distance from the snout (36 millimeters) equals 1¼ times the length of the head; its length of base (7 millimeters) equal to length of snout. Its longest spine, when laid backward reaches beyond origin of second dorsal, its length (15 millimeters) one-half to two-thirds that of the head.

Second dorsal very low; its distance from first dorsal equal to one-third length of head; in the type about one-fourth.

Anal much higher than second dorsal, yet very low, its longest ray equal in length to diameter of eye; its distance from snout (51 millimeters) 4⅔ times in total length, its origin being nearly under that of the second dorsal.

Pectoral inserted under origin of first dorsal, its length about ½ that of head.

Ventral inserted behind the vertical from the end of the base of the first dorsal in the type. In the mutilated larger specimen it appears to be under the posterior ray of the first dorsal. The ventral extends to the origin of the anal, its length (10 millimeters) equaling diameter of eye; in large specimen 1¼ diameter of eye. Vent about midway between origin of ventrals and anal.

Radial formula: D. II, 8–9; A. 120; V. 7; P. 13.

In a distance equal to length of head 32 rays were counted in the dorsal fin; in the anal fin, 22.

Color, brown; abdomen and lower part of head in young blackish.

CETONURUS, Günther.

Cetonurus (as subgenus), GÜNTHER, Challenger Report, XXII, 1887, 124, 143.

A *Macrurus*-like form, with immense, thick, angular head, with cavernous bones; with quadrate massive snout, and with trunk exceedingly short, running into a short, much compressed, and low tail immediately behind the vent. First dorsal with about 10 spines, inserted over or in advance of the origin of the pectorals; the second and longest spine slender, obscurely serrated. Ventrals moderate, inserted under or in advance of insertion of pectorals. Head with dense, flaccid skin, thickly covered with small villous scales; scales of body with a few long, slender, curved spines. No lateral line. A series of larger scales along base of second dorsal, which is weak and low. Bones thin and flexible.

The type of this genus or subgenus is *Cetonurus crassiceps*, Günther (Challenger Report, XXII, 143, pl. XXXVII; Ann. and Mag. Nat. Hist., II, 1878, 25), taken by the *Challenger* north of the Kermadec Islands, in 520 fathoms.

CETONURUS GLOBICEPS, VAILLANT. (Fig. 344.)

Macrurus globiceps, VAILLANT, La Nature, 1884, No. 560.
Hymenocephalus globiceps, VAILLANT, Exped. Scient. Travailleur et Talisman, 214, 386.
Hymenocephalus crassiceps, VAILLANT, *op. cit.*, 214, pl. XX, fig. 1.

Head and anterior part of body very large; the greatest height two-elevenths, its greatest thickness one-twelfth of total length. Head globular in form, its length one-fifth that of the body. Snout turgid, obtuse. Mouth moderate, inferior. Body greatly contracted behind the vent, which is in vertical from posterior end of first dorsal.

Diameter of eye about one-fourth the length of the head. Width of the interorbital space two-fifths the length of the head. Barbel small and slender.

Opercula covered by thick skin, only visible upon dissection. Small rough scales covering entire head; those upon body also small, very rough; a row of much stronger ones along the base of the second dorsal. Lateral line not perceptible. About 200 scales in longitudinal row, 51 in vertical row.

First dorsal small, its second spine slender, covered with weak serrations. Second dorsal low and with feeble spines, its origin separated from the end of the first dorsal by a space equal to twice the length of the base of the latter. Anal much higher than the second dorsal, its anterior rays much the longest; its origin nearly under that of the second dorsal. Pectorals moderate, falciform, reaching beyond origin of anal. Ventrals small, in advance of the pectorals.

Radial formula: D. II, 9 + ?; A. 103?; V. 10.

The French expedition obtained 17 examples in the Gulf of Gascony at 1,600 meters, on the coast of Soudan at 1,139 to 1,435 meters, and off the Azores at 2,995 meters. It has not yet been found in the Western Atlantic.

CHALINURA, Goode and Bean.

Chalinura, GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 199.
Chalinurus (subgenus), GÜNTHER, Challenger Report, XXII, 144.

Scales cycloid, fluted longitudinally with slightly radiating striæ. Snout long, broad, truncate, not much produced. Mouth lateral, subterminal, very large. Head without prominent ridges, save the subocular ones and those upon the snout; the suborbital ridge is not joined to the angle of the preoperculum. Teeth in the upper jaw in a villiform band, with those in the outer series much enlarged; those in lower jaw uniserial, large. No teeth on vomer or palatines. Dorsal spine serrated. Pseudobranchiæ present, but small. Gill rakers spiny, depressible, stout, in double series on the anterior arch. Branchiostegal membrane apparently free from the isthmus. Ventrals below the pectorals. Barbel present.

We protest against the action of English ichthyologists in changing the form of the generic name. It is properly and legitimately formed from Χᾰλινός (a thong), and οὐρᾰ (tail).

Chalinura fernandezianus, Günther (Challenger Report, XXII, 145, pl. XXXVIII, fig. B) was obtained by the *Challenger* at station 300, south of Juan Fernandez, in 1,375 fathoms.

Chalinura liocephala, Günther (*loc. cit.*, 145, pl. XXXVIII, fig. A) was taken by the *Challenger* off Japan, in 1,875 fathoms, and in mid Pacific in 2,050 fathoms.

Chalinura Murrayi, Günther (*loc. cit.*, 146, pl. XXXIV, fig. A) was taken by the *Challenger* off New Zealand in 1,100 fathoms.

Chalinura serrula, Bean (Proc. U. S. Nat. Mus., XIII (No. 795), 37) was taken by the *Albatross* east of Prince of Wales Island, in 1,569 fathoms.

Chalinura hispida, Alcock, from the Bay of Bengal, 220–240 fathoms (Ann. Mag. Nat. Hist., 1889, Nov., 397).

CHALINURA SIMULA, GOODE AND BEAN. (Figure 345.)

Chalinura simula, GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 199.
Macrurus simulus, GÜNTHER, Challenger Report, XXII, 1887, 143.

The most salient characters are (1) the very large mouth, (2) the long obtuse snout, and (3) the very elongate first ventral ray.

The body is shaped much as in *Coryphænoides*, but is rather stout, its greatest height being contained 6 times in its total length. The back is somewhat gibbous in profile, the dorsal outline rising quite rapidly from the interorbital region to the origin of the first dorsal, whence it descends almost in a straight line to the end of the tail.

The scales are rather small, but with indications, particularly on the head, of radiating striæ. The number of scales in the lateral line is about 150; about 8 rows between the origin of the dorsal and the lateral line, and 17 to 19 between that line and the origin of the anal.

The length of the head is contained about 5 times in the total length of the body. The width of the interorbital area is much greater than the long diameter of the orbit, which is nearly twice that of the snout. The postorbital portion of the head is about three times as long as the diameter of the eye. The length of the operculum is equal to half that of the upper jaw. The preoperculum is emarginate on its posterior limb. The orbit is nearly round, its diameter contained 6 times in the length of the head. The snout is broad, obtuse, scarcely projecting beyond the mouth; its width nearly as great at the tip as that of the interorbital space or as its own length. The median ridge is very prominent, gibbous in outline when observed laterally; the lateral ridges start out almost at a right angle with the median ridge, and are not continued upon the sides of the head. The suborbitals prominent, forming broad subocular ridges. No supraorbital ridges. Nostrils in front of the middle of the eye, and nearer to its anterior margin than to the tip of the snout. Barbel longer than the diameter of the eye.

Teeth in the upper jaw in a broad villiform band, with the outer series very much enlarged. The lower jaw with the teeth in a single series.

Distance of first dorsal from snout 4½ times the length of its base, its distance from the anterior margin of the orbit about equal to the length of the head. First spine very short, second rather stout and with a simple serration anteriorly, the serræ closely appressed to the spine; its length two-thirds that of head.

The second dorsal begins at a distance from the first about equal to the length of the upper jaw.

The anal is high, its average rays being about three times as long as those in the dorsal. It is inserted slightly behind the perpendicular from the last ray of the first dorsal. The pectoral is inserted over the base of the ventral (its rays are mutilated). The ventral is inserted almost under the pectoral, but very slightly in advance; its distance from the snout is less than the length of its longest ray, which is prolonged in a filament which extends to the base of the eighteenth ray of the anal fin.

Radial formula: D. II, 9, 113; A. 118; P. 20; V. 9; B. VI.

The type specimen, 458 millimeters in length, was taken by the *Blake* from station CCCVIII, in 41° 25′ 45″ N lat., 65° 35′ 30″ W. lon., at a depth of 1,242 fathoms. The *Blake* also secured specimens, apparently belonging to this species, from station CCCXVII, in 31° 57′ N. lat., 78° 18′ 35″ W. lon., at a depth of 333 fathoms; and from station CCCXXV, in 33° 35′ 20″ N. lat., 76° W. lon., at a depth of 647 fathoms.

The *Albatross* obtained examples from station 2095, in 39° 29′ N. lat., 70° 58′ 40″ W. lon., at a depth of 1,342 fathoms; from station 2105, in 37° 50′ N. lat., 73° 03′ W. lon., at a depth of 1,395 fathoms; and Cat. No. 33280, U. S. N. M., from station 2037, in 38° 53′ N. lat., 69° 23′ 30″ W. lon., at a depth of 1,731 fathoms.

CHALINURA BREVIBARBIS, GOODE and BEAN, n. s.

The length of the specimen described is 345 millimeters. It is almost entirely denuded of scales; those that remain have about six longitudinal ridges composed of small spines as in the species of *Macrurus*. The first gill opening also is restricted as in *Macrurus*. The teeth of the upper jaw are in a villiform band with the outer series enlarged. Mandibulary teeth uniserial.

The greatest height of the body (54 millimeters) equals the length of the head without the snout. The length of the intermaxilla is one-third the length of the head. The maxilla extends to below the hind margin of the orbit. The length of the mandible is nearly one-half that of the head, which is 68 millimeters long, being about one-fifth of the the total length. The barbel (8 millimeters) is two-thirds as long as the eye and one-half as long as the snout. The length of the eye (11 millimeters) is one-sixth the length of the head, and one-half the width of the interorbital space.

The second spine of the dorsal (42 millimeters) equals the length of the postorbital part of the head. The ventral when extended reaches to the sixth ray of the anal. The distance from the ventral to the vent equals one-half the length of the head. The length of the pectoral equals the postorbital part of the head.

D. II, 8; the first 31 rays of the second dorsal occupy a space equal to the length of the head. Anal: the first 25 rays occupy a space equal to the length of the head. The longest anal rays are nearly half as long as the pectoral.

The interspace between the first and second dorsals is one-half of the interorbital part of the head. Ventral 9. Scales 8—140.

The type of the species, Cat. No. 33453, U. S. N. M., was taken by the *Albatross* on September 4, 1883, at station 2077, in 41° 09′ 40″ N. lat., 66° 02′ 20″ W. lon., at a depth of 1,255 fathoms. Examples were also obtained by the *Albatross* from station 2530, in 40° 53′ 40″ N. lat., 66° 24′ W. lon., at a depth of 956 fathoms; Cat. No. 33269, U. S. N. M., from station 2037, in 38° 53′ N. lat., 69° 23′ 30″ W. lon., at a depth 1,731 fathoms; Cat. No. 35560, U. S. N. M., from station 2210, in 39° 37′ 45″ N. lat., 71° 18′ 45″ W. lon., at a depth of 991 fathoms; Cat. No. 33396, U. S. N. M., from station 2077, in 41° 09′ 40″ N. lat., 60° 02′ 20″ W. lon., at a depth of 1,255 fathoms; Cat. No. 33272, U. S. N. M., from station 2035, in 39° 26′ 16″ N. lat., 70° 20′ 37″ W. lon., at a depth of 1,362 fathoms.

CHALINURA OCCIDENTALIS, GOODE and BEAN.

Malacocephalus occidentalis, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 597.—GÜNTHER, Challenger Report, XXII, 1887, 134, note.

A species which in general appearance and proportions resembles *Malacocephalus lævis*, Günther. Anal fin commencing at a distance behind the vent equal to the length of the snout, its distance from the origin of the ventrals being less than the distance from the origin of the anal, which is distinctly behind the vertical through the posterior end of the first dorsal. The ventrals originate under the middle of the first dorsal, and the pectorals under its origin. The ventral extends to, or slightly beyond, the anal origin. The pectoral is as long as the head without its postorbital part. The diameter of the eye is contained 2¼ times in the length of the head. The barbel is slightly longer than the eye. The snout is one-quarter as long as the head and equal to the interorbital space.

It differs also in the serrature of the second dorsal spine, and its length, which is nearly equal to, if not longer than the head. In our mutilated specimens the first branched ray is nearly as long as the head. The gill rakers are rudimentary, there being 11 below the angle of the first arch.

The types of this species are small and in very bad condition, making it difficult to determine the dentition with certainty, but the intermaxilla has an outer series of enlarged teeth and behind a villiform band of smaller teeth. The mandibulary teeth are uniserial, all small and unequal in size. The gill membrane is attached to the isthmus, but has a narrow, free margin behind. The scales are studded with minute spines, but have no median keel. The intermaxilla is protractile almost in a vertical direction; it is a long bone, being continued beyond the vertical expansion.

D. I, 10; the long second ray coarsely serrated.

A single specimen, 141 millimeters in length, was obtained by the *Blake* from station LXXXIII, off Granada, at a depth of 164 fathoms. The *Albatross* secured an individual from station 2474, in 44° 28′ 30″ N. lat., 57° 10′ 45″ W. lon., at a depth of 133 fathoms; and two small specimens, 154 and 203 millimeters in length, respectively, from station 2310, in 35° 44′ N. lat., 74° 51′ W. lon., at a depth of 132 fathoms.

CHALINURA LEPTOLEPIS, GÜNTHER.

Coryphænoides leptolepis, GÜNTHER, Ann. and Mag. Nat. Hist., 1877, XX, 441.
Macrurus (Chalinurus) leptolepis, GÜNTHER, Challenger Report, XXII, 144, pl. XXXI.

Head compressed. The snout is rather long, but its front projects but slightly beyond the mouth, which is almost anterior. The eye is comparatively small, rather more than one-half the length of the snout, or one-seventh the length of the head and three-fifths the width of the interorbital space. Mouth wide, lateral, extending to below the hind margin of the eye. The teeth of the outer series of the upper jaw are widely set and much stronger than those of the villiform band. Mandibulary teeth in a single series. Barbel as long as the eye. The preoperculum with the hind margin excised, and with the angle rounded and produced backwards, naked; its lower margin is not toothed.

Scales thin and deciduous; most with 5 or 7 radiating keels, some, especially on the back, nearly or quite smooth. There are 7 scales in a transverse series between the first dorsal and the lateral line. Those on the gill-cover and in front of the ventral fins are quite smooth; the front part of the snout and the lower half of the infraorbital region scaleless. Second dorsal spine slightly produced, with barbs in front, which are rather distantly arranged. The second dorsal fin commences at a short distance behind the first. The outer ventral ray produced into a long filament. Distance between vent and isthmus equal to the length of the head.

Radial formula: D. 19; P. 18; V. 9.

A single specimen was obtained by the *Challenger* off the coast of Brazil in 350 fathoms.

OPTONURUS, GÜNTHER.

Optonurus (as subgenus), GÜNTHER, Challenger Report, XXII, 147.

A genus or subgenus of *Macruridæ*, distinguished from *Chalinura* chiefly by the absence of denticulations from the first dorsal spine. The only species assigned by *Günther* to this group is *O. denticulatus* (Richardson), which occurs in moderately deep water off the coasts of South Australia and New Zealand. The *Challenger* obtained it off New Zealand at a depth of 275 fathoms, and off the Kermadecs, in 520 fathoms.

MALACOCEPHALUS, Günther.

Malacocephalus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 396; Challenger Report, XXII, 124, 148 (type, *M. lævis*, Lowe).

Intermaxillary teeth biserial, mandibulary teeth uniserial. Mouth lateral; snout short, obtuse. Head without prominent ridges, with wide muciferous cavities. Dorsal fin planted over origin of pectorals, its longest spine smooth. Pectorals placed high, opposite upper angle of gill cleft. Scales small, bristly. Lateral line originating at upper angle of gill cleft.

Malacocephalus occurs in the northeastern, southeastern, and southwestern Atlantic, the Mediterranean and the Bay of Bengal.

The *Macrurus macrochir* assigned here by Dr. Günther does not appear to us to be congeneric with *Malacocephalus lævis*. We have therefore proposed for it a new genus under the name *Abyssicola*, the diagnostic characters of which are given on page 417.

MALACOCEPHALUS LÆVIS, (Lowe), Günther.

Macrurus lævis, Lowe, Proc. Zoöl. Soc., London, 1843, 92.[1]

Macrurus (*Malacocephalus*) *lævis*, Günther, Challenger Report, XXII, 1887, 148, pl. XXXIX, fig. B; Ann. and Mag. Nat. Hist., Dec., 1889, 418.—Alcock, Ann. and Mag. Nat. Hist., 1889, 398.

Malacocephalus lævis, Günther, Cat. Fish. Brit. Mus., IV, 397.—Lütken, Vid. Meddel. Nat. Foren., Kjobenhavn, 1872, 1.—Moreau, Hist. Nat. Poiss., France, III, 284.

Head compressed, with vertical sides; muciferous cavities wide. Snout obtusely conical, slightly projecting beyond the mouth, the cleft of which is oblique, anterior and lateral, and extending somewhat behind the middle of the eye. Teeth of the upper jaw biserial, those of the outer series much stronger than the inner; mandibulary teeth uniserial. Barbel shorter than the eye. The interorbital space flat, its width being equal to or less than the diameter of the eye, which is large, longer than the snout, and one-third or two-sevenths of the length of the head. Scales very small, much deeper than long, covered with short minute bristles. Præoperculum with the posterior margin slightly excised above the angle, and with the lower margin not serrated. The entire head is covered with minute, rough scales. Anterior dorsal spine smooth. Pectoral fin about two-thirds of the length of the head. The vent (Fig. *b*) is close to the root of the ventrals, which reach beyond it; it lies at the end of an oval scaleless depression, and there is another triangular scaleless space between the roots of the ventrals. Distance between the vent and the isthmus two-thirds of the length of the head.

Brownish above, sides silvery; axil, ventrals and the region in front of them black; branchial cavity partly black, inside of the mouth white. (*Günther.*)

Radial formula: D. 13-14; P. 17; V. 9.

The type, 16 inches long, obtained by Lowe at Madeira, is in the British Museum, where it was examined by us in 1883. Lütken has found the species on the coast of Denmark, and Günther records its capture southwest of Ireland in 250 fathoms and in the Mediterranean. The *Challenger* obtained a single specimen off the coast of Pernambuco (station 122) in 350 fathoms. The *Investigator* obtained a form supposed by Alcock to be identical with this in the Andaman Sea in 265 fathoms, and in the Laccadive Sea in 188-220 fathoms. It has not yet been observed in the northwestern Atlantic.

Günther's revised diagnosis is given above.

MALACOCEPHALUS OCCIDENTALIS, Goode and Bean. (Doubtful species).

Malacocephalus occidentalis, Goode and Bean, Proc. U. S. Nat. Mus., 1885, 598.

Small specimens, 37336, in imperfect condition were obtained from *Albatross* station 2310, north latitude 35° 44′, west longitude 74° 51′ (length 154 millimeters and 203 millimeters), at a depth of 132 fathoms, and from *Blake* station LXXXIII, off Granada, at a depth of 164 fathoms (length 141 millimeters). They correspond in the main with Günther's full description of *Malacocephalus lævis*, but differ in the position of the vent, the ventrals, and the anal fin; the latter commencing at a distance behind the vent equal to the length of the snout, its distance from the origin of the ventrals being less than the distance from the origin of the anal, which is distinctly behind the vertical through the posterior end of the first dorsal.

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[1] *Macrurus lævis.* *M. pallidus*, griseus, lucidus, lævigatus lissinis areolato-scaber, inermis; squamis inconspicuis minutis; capite rostroque acuto abbreviatis, simplicibus (nec cœlatis nec carinatis); oculis rotundatis; dentibus in maxilla inferiore validis, uniseriatis; pinnæ dorsalis primæ radio primo inermi.

1 D. 1+9; 2. D. et. A. 8; P. 15; V. 1+7.

The ventrals originate under the middle of the first dorsal, and the pectorals under its origin. The ventral extends to, or slightly beyond, the anal origin. The pectoral is as long as the head without its postorbital part. The diameter of the eye is contained 2¼ times in the length of the head. The barbel is slightly longer than the eye. The snout is ¼ as long as the head and equal to the interorbital space.

It differs also in the serrature of the second dorsal spine, and its length, which is nearly equal to, if not longer than, the head. In our mutilated specimens the first branched ray is nearly as long as the head. The gill-rakers are rudimentary, there being 11 below the angle of the arch.

NEMATONURUS, Günther. (Figure 346.)

Nematonurus (subgenus), GÜNTHER, Challenger Report, XXII, 124, 150.

Macrurid fishes, with comparatively short, thick, fusiform body; short, globular head; very obtusely rounded snout, and with eye close to profile. Mouth entirely inferior, but not far from tip of snout. Teeth uniserial in the jaws. Branchial opening very wide, the branchiostegal membrane adhering slightly (in *N. gigas*) to the isthmus. Head entirely covered with large spinigerous scales, like those upon the body. Muciferous cavities not greatly enlarged. Lateral line originating at a distance from gill-opening, usually above it. Pectorals placed medially, below upper angle of gill-cleft. Ventrals stout, with outer ray filamentous. Dorsal origin behind that of pectoral, its longest spine serrated (though but slightly in *N. gigas*). A considerable space between the two dorsals. Second dorsal and anal not very unlike in height, the anal being somewhat further forward.

Three species appear to belong clearly to this group; *N. armatus* (Hector), from the South and Middle Pacific, 400–2,425 fathoms (Challenger Report, XXII, 150, pl. XL, fig. A); *N. affinis* (Günther), from the east coast of South America, 1,900 fathoms; and *N. gigas* (Vaillant), from the North Atlantic, 2,082–2,128 fathoms.

Nematonurus is a thoroughly characteristic bathybial genus.

NEMATONURUS GIGAS, (VAILLANT), GOODE and BEAN.

Coryphænoides gigas, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 232, pl. XX, fig. 2.

Height of body one-sixth of its length; its thickness one-eighth, being stout, comparatively short, and, like the head and snout, inflated. Length of head about equal to height of body. Mouth large, inferior, under the eye. Teeth in jaws in a single row, simple, conical, about 20 to 25 on each side of either jaw. Eye close to profile, its diameter one-fifth the length of the head, and a little less than width of interorbital space, which is one-fourth of head. Length of barbel equal to diameter of eye, which is about equal to the length of the snout. Scales strongly spinigerous, with spines arranged in radiating rows. Nine above and thirty-four rows below lateral line, which contains 138 scales. Head covered with rough scales like those on the body. Limb of preoperculum concave.

First dorsal placed comparatively far back, without elevation of the dorsal outline at its base; its second spine almost smooth, but with a few rugosities near its tip; its height equal to about half that of the body. Distance of second dorsal from first equal to 2½ times the length of the base of the latter and a little less than the length of the head. Origin of anal nearly under middle of interspace between dorsals. Its height similar to that of second dorsal. Pectorals rather strong, with outer ray somewhat produced. Ventrals slightly behind root of pectoral, far in front of origin of dorsal, rather strong, with outer ray produced.

Color gray; branchiostegal membrane and fins brownish.

D. 10 + 87; A. 107; V. 10.

Two specimens were obtained by the French expedition between the Azores and the French coast in 4,165 and 4,255 meters.

MOSELEYA, Goode and Bean, n. g. (Figure 347.)

Macrurids, having the dorsal sub-continuous; the anal much higher than the second dorsal. Head and snout long, *Gadus*-like; mouth large, lateral, subterminal. Scales small, not spinigerous, but with about five feeble radiating keels. Ventrals in advance of pectorals. Vent far forward, almost under last rays of first dorsal. Pectorals and ventrals strong, falciform, the outer ray of each prolonged, that of the ventral exceedingly. Dorsal spine feebly serrate. Barbel minute.

This genus is proposed for the reception of *Macrurus longifilis*, Günther (Ann. and Mag. Nat. Hist., 1877, XX, 439; Challenger Report, XXII, 1887, 151, pl. XXXV), a species obtained by the *Challenger* at station 235, south of Yeddo, Japan, at a depth of 565 fathoms. The type is 28 inches long, and is admirably figured in the Challenger Report.

The genus is named in honor of Professor Henry N. Moseley, F. R. S., of Oxford University, whose contributions to natural history while naturalist of H. M. S. *Challenger*, we desire to commemorate.

ABYSSICOLA, Goode and Bean, n. g.

Macrurids with villiform intermaxillary teeth, uniserial mandibulary teeth. Dorsal, ventral, and pectoral origins nearly in the same vertical; pectoral very long, spatulate. Dorsal fins separated by a considerable interval. Snout produced, tetrahedral. Interorbital space flat, wide. Mouth wide, lateral; the intermaxillary shorter than maxillary.

This genus is based upon *Macrurus macrochir*, Günther, obtained by the *Challenger* at station 232, on the *Hyalonema* ground off Inosima, Japan, at a depth of 345 fathoms (Günther, Ann. and Mag. Nat. Hist., 1877, XX, 438; Challenger Report, XXII, 1887, 148, pl. XXIX, fig. B). The type, which was 27½ inches long, is admirably figured in the Challenger Report (Figure 348).

TRACHYRHYNCHUS, Giorna.

Trachyrincus, Giorna, Mem. Accad. Imp. Turin, XVI, 178, 1803.
Trachyrhynchus, Günther, Challenger Report, XXII, 1887, 152.
Lepidoleprus, Risso, Ichth. Nice, 1810, 197 (type, *L. trachyrincus*, Risso).
Oxycephus, Rafinesque, Indice d'Ittiol. Siciliana, 1810 (type, *O. scabrus*, Raf.=*L. trachyrhincus*, Risso).
Lepidosoma, Swainson, Nat. Hist. and Class. Fish., 1838, II, 261.

Snout produced into a long depressed process, sharply pointed in front, and with a rather sharp lateral edge, which is continued in a straight line across the infraorbital region. Mouth horseshoe-shaped, situated at the lower side of the head. Teeth in both jaws in villiform bands. A barbel. A scaleless fossa on each side of the nape. The second dorsal fin well developed from its beginning. Scales of moderate size, more or less spinigerous; a series of larger scales, each armed with a projecting ridge along each side of the base of the anterior portions of the dorsal and anal fins. Of the gill-covers the operculum is particularly small. Gill membranes scarcely united in front. Four gills with well-developed gill laminæ. The first branchial arch is free and provided with short styliform gill-rakers. (*Günther.*)

Trachyrhynchus longirostris, Günther, (Challenger Report, XXII, 153, pl. XLI, fig. B), was taken by the *Challenger* Northeast of New Zealand, in 1,700 fathoms.

TRACHYRHYNCHUS SCABRUS, (Rafinesque), Goode & Bean. (Figure 349.)

Mysticetus auctoris, Aldrovandus, De Piscibus, 1638, 342.
Trachyrincus (no specific name), Giorna, Mem. Accad. Sci., Turin, XVI, 1805, 178, pl. I, figs. 1, 2.
Oxycephas scabrus, Rafinesque, Indice d'Ittiologia Siciliana, 1810, pl. I, figs. 1, 2.
Lepidoleprus trachyrinchus, Risso, Ichth., Nice, 1810, 197, pl. VII, fig. 21.—Bonaparte, Catologo Metodico, 1846, 42.—Canestrini, Arch. per la Zoöl., 1864, 371, pl. XII, fig. 2.
Lepidosoma trachyrhynchus, Swainson, Nat. Hist. and Class. Fish., 1838, II, 261.
Macrurus trachyrhynchus, Günther, Cat. Fish. Brit. Mus., IV, 1862, 315.—Canestrini, Fauna Italica, Pesci, 315.—Vinciguerra, Ann. Mus. Genov., XIV, 617; XVIII, 564; Crociere del Violante, 100.—Vaillant, Exp. Sci. Travailleur et Talisman, 250, pl. XXI (scale.).—Capello, Peixes de Portugal, 1880, 32.
Trachyrhynchus trachyrhynchus, Günther, Challenger Report, XXII, 152, pl. XLI, fig. C.

Snout not quite twice as long as the eye, the horizontal diameter of which is much greater than the vertical, about one-fourth of the length of the head, and equal to the width of the interorbital space above the center of the orbit. Scales very rough, each with 3 or 4 acute and prominent spines; 4 series between the first dorsal fin and the lateral line; the crests of many of the enlarged dorsal scales are coarsely denticulated. The entire abdomen covered with scales. Distance of vent from the isthmus equal to that of the hind margin of the eye from the extremity of the snout. Barbel very small. Ventrals small, inserted in front of the pectoral fin, with the outer ray produced into a short filament. Anterior branchial arch with 22 very short, styliform gill-rakers. (*Günther.*)

This form, the *Pizzune* or *Pesci sorici* of the Sicilian fisherman, the *Ralto* of Cornigliano, has been found in the vicinity of Nice and Genoa, as well as about Sicily, but not as yet in the Adriatic. Vinciguerra states that in the Gulf of Genoa it is more abundant than *Cœlorhynchus.* With the long line at 600 fathoms, off Genoa, he obtained 16 specimens of this form and none of the other. Both are taken at sea, some miles out from Genoa, by the fishermen of Cornigliano, at depths of 300 fathoms or more. The French ships took 61 specimens off the South European and African coast in 400 to 1,400 fathoms.

Canestrini gives a fair figure and Vinciguerra a better one.

TRACHYRHYNCHUS MURRAYI, GÜNTHER.

Trachyrhynchus Murrayi, GÜNTHER, Challenger Report, XXII, 1887, 153, pl. XLI, Fig. A.

The large orbit is oval in shape, nearly one-fourth of the length of the head, contained once and two-thirds in the length of the snout, and equal to the width of the interorbital space above the middle of the orbit. Scales almost smooth, having 1, 2, or 3 small spines developed on their hind margin; they are rather irregularly arranged, in 4 series, between the dorsal fin and the lateral line; crests of the dorsal scales simple, triangular, spines directed backwards, without denticulation. The abdomen between the vent and the roots of the ventral fins scaleless. The distance of the vent from the isthmus nearly equal to that of the hind margin of the eye from the extremity of the snout. Barbel minute. Ventral fin very small, scarcely in front of the pectoral, with the outer ray produced into a filament, which does not reach the vent. Pectoral as long as the postorbital portion of the head. Anterior branchial arch with 22 very short styliform gill-rakers.

Light yellowish (in spirits): vertical fins, ventral filament, interior of the mouth and branchial cavity black. D. 9; P. 23; V. 7. (*Günther.*)

This species was discovered by the *Knight Errant* in the Faroe channel, station 4, at a depth of 555 fathoms.

MACRURONUS, Günther.

Macruronus, GÜNTHER, Zoöl. Record, VIII, 1873, 103; Challenger Report, XXII, 1887, 157.

Head and body compressed, covered with cycloid scales; trunk not abbreviated. Bones of the head rather firm, with narrow cavities. Eye large; snout rather pointed; mouth wide, lateral. Teeth in the upper jaw biserial, those of the outer series and those of the single mandibulary series strong. Gill-membrane slightly united in front; 7 branchiostegals; 4 gills with the gill-laminæ well developed; the first branchial arch free, with long lanceolate gill-rakers. Rays of the second dorsal well developed throughout its length. Barbel none.

This genus includes a single species, *Macruronus Novæ-zelandiæ*, (Hector), Günther. (Figure 350.) (Hector, Trans. New Zealand Inst., III, 136, pl. XVIII, fig. 1.—Hutton, Fish. New Zealand, 49.—Günther, Challenger Report, XXII, 1887, 157.)

Of this fish Dr. Günther examined specimens from New Zealand, Tasmania, and the Messier Channel, the largest being nearly 2 feet long. "All of them," he writes, "seem to have been caught near the surface and at no great distance from the shore, and it is not probable that it descends to the same great depth as the other *Macruri.* Like *Lepidopus*, it seems to live for the greater part of the year at a small depth, and to periodically approach the shore at certain seasons. Hutton says that it is thrown up in large quantities on the shores of Cook Straits after heavy gales."

STEINDACHNERIA, GOODE & BEAN, n. g.

Steindachneria, GOODE & BEAN, in Agassiz, Three Cruises of the Blake, II, p. 26, 1888.

A genus of *Macruridæ*, with large terminal mouth, compressed body, and tapering tail; a short spinous dorsal and a long, soft dorsal fin, the two contiguous. Both dorsals elevated anteriorly; anal fin consisting of a differentiated elevated anterior portion and a very long low portion. Vent in the anterior third of the length. The intermaxillary and mandibular teeth biserial, the outer series much enlarged. Vomerine teeth present. Head of moderate size, its bones soft and cavernous. Eye large. Gill openings wide, the membranes connected anteriorly, but not attached to the isthmus; gill rakers slender, moderately numerous. No pseudobranchiæ. Branchiostegals, 7. Pectorals and ventrals both immediately under the spinous dorsal. Scales thin, cycloid, and deciduous.

Similar in appearance to *Macruronus novæzelandiæ*, from which it differs in several important particulars: (1) The tail is much more tapering in *Steindachneria;* (2) the vent is in advance of the end of the anterior third of the body; (3) the anal fin has a distinct elevated portion; (4) vomerine teeth are present; (5) the bones of the head are soft and cavernous.

This remarkable genus is named in honor of Dr. Franz Steindachner, Custos of the Imperial Zoölogical Museum of Vienna.

STEINDACHNERIA ARGENTEA, GOODE and BEAN, n. s. (Figure 351.)

The head and body are compressed and the tail tapers to a very fine point. Greatest height of the body at the origin of the ventral (30 millimeters in the type specimen) is contained 7½ times in the total length. The height at the anal origin (28 millimeters) is contained about 8 times in the total length.

Scales are small, deciduous, cycloid, 6 rows between the lateral line and the origin of the soft dorsal. The origin of the anal is about under the seventeenth row of scales. The length of the head (42 millimeters) is contained 5½ times in the total length. The interorbital area equals the length of the snout and nearly one-fifth the length of the head. The postorbital part of the head (22 millimeters) is nearly twice as long as the eye, which is (12 millimeters) slightly more than one-fourth the length of the head. The snout is obtuse, its length about three-fourths that of the eye. The nostrils are placed nearer to the eye than to the end of the snout; the anterior nostril is nearly circular, the posterior much longer and slightly concave. No barbel. The maxilla is dilated at the extremity and is somewhat produced downward into an obtuse point. It extends nearly to the vertical through the posterior margin of the orbit, and can be concealed under the preorbital. Its length (20 millimeters) is nearly one-half that of the head. The intermaxilla is slightly protractile, much attenuated posteriorly, its length about equal to that of the maxilla. The mandible extends slightly behind the posterior margin of the eye, its length (24 millimeters) equaling twice the length of the eye. Intermaxillary and mandibular teeth biserial, the outer series enlarged and rather widely set. Some of the enlarged teeth are slightly sagittate at the tip. Vomerine teeth well developed. Upper pharyngeals in two broad, well-developed patches. Gill-rakers slender, about 19 on the first arch, 4 or 5 of which are above the angle. The longest gill-raker is nearly one-half as long as the eye.

The distance of the first dorsal from the snout (44 millimeters) is nearly one-fifth of the total length. The first spine is elongate, filiform, and when laid backward reaches the fourteenth ray of the second dorsal. The base of the fin about equals the length of the eye. The longest ray of the second dorsal (the second) is about two-fifths the length of the head. The rays diminish in size very rapidly, becoming minute at the extremity of the tail. The anal originates under the sixth ray of the second dorsal, not far behind the vent. The anterior elevated portion consists of 10 rays, all of which except the first are divided. The second ray is the longest, its length (24 millimeters) being twice the length of the eye. The last ray is only about one-seventh as long as the second. It is separated by a small membrane from the remaining portion of the fin, which consists of very minute rays, the longest of them scarcely more than 2 millimeters in length. The vent is under the fourth ray of the second dorsal. The ventral is placed under the base of the pectoral and about under the third spine of the first dorsal. Its first ray is filamentous, reaching, when extended, to the anal origin. The pectoral when extended reaches to below the fifteenth ray of the second dorsal, its length (42 millimeters) equalling the length of the head.

Radial formula: D. VIII, 123+; A. 10+113; P. 15; V. 8. Color, silvery; upper parts light brown; belly purplish; inside of mouth dark.

The type specimen, Cat. No. 37350, U. S. N. M., 233 millimeters in length, was obtained by the *Albatross* from station 2378, off the delta of the Mississippi River, in 30° 14′ 30″ N. lat., 88° 09′ 30″ W. lon., at a depth of 68 fathoms.

BATHYGADUS, Günther.

Bathygadus, GÜNTHER, Ann. and Mag. Nat. Hist., II, 1878, 23; Challenger Report, XXII, 1887, 154.

Radial formula: A genus of *Macruridæ* with large terminal mouth, prominent nape, no teeth, lanceolate gill rakers; free, notched branchiostegal membrane; high vertical fins; first dorsal composed largely of branched rays; anal fin set far back.

Head large, fleshy, without prominent ridges, spiny armature or external depressions; nape elevated, hump-like. Snout broad, obtuse, not produced. Mouth terminal, very large; suborbital ridge very low, not joined to the angle of the preoperculum. The maxillary may be entirely received within a groove under the prefrontal and suborbital bones; its tip narrowed and blade-like; intermaxillaries protractile downwards, separated anteriorly, rib-shaped, compressed vertically, very broad and without true teeth; provided posteriorly with a short flange, which is received underneath the maxillary. Mandible received within the intermaxillary bones, without true teeth, but with minute asperities, similar to those in the intermaxillaries. Vomer and palatines toothless.

Barbel sometimes present. No pseudobranchiæ. Gill-rakers numerous, moderate, lanceolate, with minute denticulations along their inner edge. Branchiostegal membrane free from the isthmus, deeply cleft. Branchiostegals 7, very stiff. Gill-opening very wide. Operculum with a blunt, spine-like prominence at its angle. Ventrals below the pectorals, many-rayed, the anterior rays produced. Dorsal consisting for the most part of branched rays. Scales cycloid, plain; lateral line strongly arched over the pectoral.

Bathygadus cottoides, Günther, (Challenger Report, XXII, 154, pl. XLII, fig. A) was taken by the *Challenger* between the Kermadecs and New Zealand in 520 to 700 fathoms.

Bathygadus multifilis, Günther, (*loc. cit.*, 155, pl. XLII, fig. B) a form near to *B. longifilis*, is known only from south of the Philippine Islands in 500 fathoms.

BATHYGADUS FAVOSUS, GOODE and BEAN. (Figure 352.)

Bathygadus favosus, GOODE AND BEAN, Bull. Mus. Comp. Zoöl., XII, No. 5, 160.

The body is heavy, stout; its greatest height, at origin of first dorsal (57 millimeters in type specimen), is contained a little more than 6 times in the total length. The profile of the body descends gradually and in a slight curve from the first dorsal to the snout.

The scales are small, deciduous, cycloid, without armature, about 135 in the lateral line, about 10 above and 16 below the lateral line, the latter series counted from the vent.

The length of the head (65 millimeters) is contained about 5½ times in total length. The interorbital area is slightly convex; its greatest width (22 millimeters) equals about one-third of the length of the head. The postorbital part of the head is 2⅜ times as long as the eye, which is nearly round, its diameter equal to one-fifth the length of the head. The snout is broad, oblique, its width at the nostrils (23 millimeters) a little more than the width of interorbital area; its length (17 millimeters) slightly more than one-quarter that of the head. The nostrils are close to and in front of the middle of the eye, the posterior one somewhat the larger. No barbel.

The teeth in both jaws in villiform bands; a naked space at the symphysis of the intermaxillaries. The intermaxillary bands are more than twice as wide as those on the mandible. Vomer and palatine toothless. The longest gill-raker on the anterior arch is slightly more than half as long as the eye. The number of gill-rakers on this arch is 25, 20 being below the angle.

Pseudobranchiæ present, very rudimentary in some individuals, in others wanting or present only upon one side.

The first dorsal is distant from snout 68 millimeters, which is slightly more than length of the head; the length of its base (24 millimeters) is about equal to width of the snout at the nostrils. The fin consists of 2 spines, the first of which is minute, and 9 branched rays. The length of the longest spine, which is armed, is contained twice in that of the head (specimens examined imperfect). The second dorsal begins immediately behind the first, the membrane being continuous. The anterior rays are longest (apparently about one-fourth the length of the head).

The anal is lower than the second dorsal; its distance from the snout (112 millimeters) is about equal to one-third of the total length.

The pectoral is inserted under the anterior rays of the first dorsal and very slightly in advance of the origin of the ventral. Its length is more than half that of the head.

The distance of the ventral from the snout (69 millimeters) is contained 5 times in the total. This fin is inserted nearly under the base of the pectoral; the first ray is somewhat produced; its tip reaches to the fourth ray of the anal fin.

Radial formula: D. II, 9, 125; A. 110; V. 9; P. 14; B. 7.

Color, bluish-brown, darkest upon head and abdomen, especially in Museum specimens.

The type specimen, 350 millimeters in length, was obtained by the *Blake* from station LXXX, off Martinique, at a depth of 472 fathoms.

Collateral types were secured by the *Albatross* from station 2392, in 28° 47′ 30″ N. lat., 87° 27′ W. lon., at a depth of 724 fathoms; from station 2394, in 28° 38′ 30″ N. lat., 87 02′ W. lon., at a depth of 420 fathoms; and Cat. Nos. 34910, 34911, 34918, and 34920, U. S. N. M., from station 2117, in 15° 24′ 40″ N. lat., 63° 31′ 40″ W. lon., at a depth of 683 fathoms. The *Blake* also captured an individual at station LXXXII, in 23° 48′ N. lat., 86° 10′ 30″ W. lon., at a depth of 1,501 fathoms.

BATHYGADUS ARCUATUS, GOODE and BEAN.

Bathygadus arcuatus, GOODE and BEAN, Bull. Mus. Comp. Zool., XII, No. 5, 158.

The body is shaped much as in *Chalinura simula*, but the nape is still more convex. Its greatest height (57 millimeters in the type specimen) is 5⅔ in its total length. The back is gibbous, the dorsal outline rising rapidly from the interorbital region to the origin of the first dorsal, whence it descends gradually to the end of the tail.

The scales are moderate, cycloid, subovate, without armature; those of the abdominal region and those above the pectorals the largest. The lateral line is strongly arched over the pectorals; the length of the arched portion contained about 3¼ times in the straight portion; the greatest height of the arch is about one-fourth of the length of its chord. The number of scales in the lateral line is about 140, eight rows of scales between the origin of the dorsal and the arch of the lateral line, 13 or 14 rows of scales between the vent and the lateral line counting backwards, 22 counting forwards. Scales cover all parts of the head except the jaws and chin.

The length of the head is contained 5 times in total. Interorbital area flat, its width (11 millimeters) equal to one-sixth length of head. Postorbital portion of head about 2½ times diameter of eye. The operculum terminates in a flat obtuse spine, its length, including the flap, about equal to diameter of eye. Preoperculum entire, with a prominent ridge in advance of its posterior edge. The orbit is rounded, the least diameter of the eye equal to the length of the snout, and contained 4½ times in length of head (slightly less in the larger specimen).

Snout very broad, obtuse, the intermaxillaries extending beyond it, its width at the nostrils equal to about twice the length of the eye. Posterior extremities of the intermaxillary processes elevated, producing a decided hump upon the top of the snout. The ridge formed by the prefrontal and suborbital bones terminates very slightly behind the posterior margin of the orbit, and is not connected with the angle of the preoperculum.

Nostrils immediately in front of the lower part of the eye, not tubular, the anterior one very small, pore-like, only about one-fourth as large as the posterior one. Distance of anterior nostril from tip of snout about three-fourths length of eye. Length of barbel (51 millimeters) 6⅜ in length of body, and equal to length of head without snout (in the larger specimen the barbel is as long as the mandible), more than 3 times as long as the eye.

There are no true teeth, the intermaxillaries and mandible being broad plates, covered with minute asperities. A naked space at the symphysis of the intermaxillaries.

Distance of first dorsal from snout (77 millimeters) nearly 3⅓ times length of its base; the fin contains 2 spinous and 10 or 11 branched rays; the first spine is minute, the second (in the types) somewhat mutilated, its length nearly 3 in length of head.[1] It is not stouter than the branched rays, and is entirely smooth.

The second dorsal is separated from the first by a very short interspace, equal to about one-third of the length of the eye. Its rays are long, subequal, the first slightly the longest, its length equal to that of the base of the first dorsal.

The anal is much lower than the dorsal, the longest rays being in front, its third ray about half as long as the first ray of the second dorsal; this fin is inserted under the seventh ray of the second dorsal. About three of the terminal rays might be considered caudal rays.

Pectoral inserted slightly in advance of the ventral, which is in about the same vertical with the origin of the first dorsal. The second ray of the pectoral is slightly produced. The length of the fin equal to that of the head without the snout.

Ventral insertion distant from the tip of the snout a distance equal to that of first dorsal from snout. The first and second rays are filamentous, the latter slightly the longer, and extending to the fifteenth (or eighteenth in larger specimen) ray of the anal fin.

Radial formula: D. II, 9–10 (135); A. (120); P. 25; V. 8.

Color, brown; vertical fins, bluish or black; peritoneum, black; inside of gill covers and roof of mouth, bluish.

The type is a specimen, 325 millimeters in length, obtained by the *Blake* from station LXXXIX, off Martinique, at a depth of 334 fathoms. A much larger specimen, 580 millimeters in length, which is referred to as a collateral type, was taken by the *Albatross* from station 2394, in 28° 38′ 30″ N. lat., 87° 02′ W. lon., at a depth of 420 fathoms. The *Blake* also secured a single specimen from station LXXXVIII, off Martinique, in 476 fathoms.

BATHYGADUS LONGIFILIS, GOODE and BEAN.

Bathygadus longifilis, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 599.—GÜNTHER, Challenger Report, XXII, 1887, 157.—ALCOCK, Ann. and Mag. Nat. Hist., 1890, 302; 1891, 123.

Hymenocephalus longifilis, VAILLANT, Exp. Sci. Travailleur et Talisman, 218, pl. XXIII, fig. 1.

The body is more compressed than in *B. macrops*. Its greatest height (31 millimeters in the largest specimen examined) contained 7½ times in total length.

Scales small, cycloid, deciduous, about 142 in the lateral line, about 25 rows from the vent upward and forward to the dorsal fin.

Length of head (40 millimeters) contained about 5¾ times in total length. Interorbital area flattened, its greatest width contained 3⅜ times in the total length of the head. Postorbital portion of the head (20 millimeters) twice as long as the eye, which is oval, its long diameter (10 millimeters) contained four times in the length of the head, and equal to length of snout.

Snout and nostrils normal.

The maxilla reaches somewhat beyond the posterior margin of orbit, its length (21 millimeters) twice in distance from snout to origin of first dorsal. Length of mandible (26 millimeters) is contained 2½ times in length of the snout. Barbel slender, long, its length (15 millimeters) equal to 1½ times orbital diameter.

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[1] Judging from the larger specimen, this spine in a usual state would be considerably longer.

Teeth in narrow villiform bands in both jaws. None on vomer or palatine bones. Gill rakers very long and slender, numerous, 35 on first arch (7 above angle), the largest (7 millimeters) contained nearly 6 times in the length of the head.

Pseudobranchiæ absent.

First dorsal of 2 stout spines, the first minute, the second elongate, and 8–9 branched rays. Its distance from snout (42 millimeters) 5½ in total. The second or longest simple ray (77 millimeters) is nearly 8 times the length of the snout, and reaches to or beyond the thirtieth ray of the second dorsal. The second dorsal contains about 140 rays; it is almost continuous with the first, its anterior rays longest and not diminishing rapidly in size toward the tail.

The anal is inserted under the ninth ray of the second dorsal, its rays much shorter than those in the dorsal, and situated about the same distance apart.

The pectorals are inserted under the anterior portion of the first dorsal, the first ray much produced, extending more than half-way from its insertion to the tip of the tail. Rays 13.

The ventral origin is slightly behind the origin of the pectoral, under the third branched ray of the dorsal, its first ray much enlarged, extending more than halfway from its insertion to tip of caudal. Its length (100 millimeters) is contained 2⅓ times in the total length. Rays 8. Branchiostegals 7.

Color, yellowish-gray, abdomen bluish.

This form is closely allied to *B. multifilis*, described by Günther from off the Philippines (Challenger Report, XXII, 1887, 155, pl. XLII, fig. B), which, however, appears to have a smaller eye, less elongate filaments, and ventral inserted in advance of the first dorsal, while the anal appears to be further back, under the twelfth or thirteenth ray of the second dorsal. Both species are provided with long, slender barbels. In other respects they are closer to *B. cottoides*, the typical species, than to *B. macrops*.

The type specimens (Cat. No. 37338, U. S. N. M.), 225 and 233 millimeters in length, were taken by the *Albatross* at station 2392, in 28° 47′ 30″ N. lat., 87° 27′ W. lon., at a depth of 724 fathoms. The *Albatross* also secured examples from station 2393, in 28° 43′ 00″ N. lat., 87° 14′ 30″ W. lon., at a depth of 525 fathoms; and from station 2385, in 28° 51′ N. lat., 88° 18′ W. lon., at a depth of 739 fathoms.

Alcock identifies with it a specimen, 8 inches long, taken in the Arabian Seas at *Investigator* station 65, in 740 fathoms and in the Laccadive Sea, in 683 fathoms.

BATHYGADUS DISPAR, (VAILLANT), GOODE and BEAN.

Hymenocephalus dispar, VAILLANT, Exp. Scient. Travailleur et Talisman, 221, pl. XXIV, fig. 1.

This form, obtained by the French explorers off the coast of Morocco at a depth of 1,105 fathoms, closely resembles the two preceding, but according to Vaillant its body is thicker, its interorbital space comparatively narrower, the ventral filament shorter, and the barbel stronger and longer. Since only one specimen was studied there is scarcely sufficient evidence that this is a well-marked species.

Vaillant's characters upon which *Bathygadus* is separated from the heterogeneous assemblage formed by him in his supposed genus *Hymenocephalus* are entirely superficial. The presence of a barbel led him to separate this form from its near ally *Bathygadus melanobranchus*.

BATHYGADUS MACROPS, GOODE and BEAN.

Bathygadus macrops, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 598.—GÜNTHER, Challenger Report, XXII, 1887, 156.

The body is somewhat compressed; its greatest height (46 millimeters in the specimen examined) is contained 6½ times in the total length.

Scales small, deciduous,[1] as nearly as can be counted 25 rows in an oblique line from the vent to the dorsal fin, 24 from the upper angle of operculum to the vertical through the origin of the anal.

Length of head (55 millimeters) contained 5¼ times in total length. Interorbital area nearly flat, its width contained 4 times in length of head. Postorbital part of head (26 millimeters) somewhat longer than diameter of eye, which is nearly round, its length (20 millimeters) contained 2¾ times in length of head. Snout broad, obtuse, its length (11 millimeters) contained 5 times in that of the head. Nostrils close to the eye, the posterior nearly twice as large as the anterior one. The maxilla extends to the vertical through posterior margin of orbit, its length (30 millimeters) equal to that of head without its postorbital portion. Length of mandible (34 millimeters) equals 3 times that of the snout. Intermaxillaries and mandible provided with narrow bands of villiform teeth, those in the mandible much shorter.

A minute barbel, about one-third as long as snout. Vomer and palate toothless.

Gill-rakers lanceolate, elongate, 26 on first arch, 7 above the angle, the longest one-seventh as long as the head. Pseudobranchiæ absent. The first dorsal consists of 2 short spines and 8 branched rays, its distance from snout (62 millimeters) contained nearly 5 times in the total length. The second or longest ray in the typical specimen twice the length of snout. The second dorsal, which contains about 125 rays, is almost continuous with the first, its anterior rays the longest, about 4 times in length of head.

The anal is inserted under the fourteenth ray of second dorsal. Its rays are all very short. In a distance equal to length of head, counting back from insertion, there are 33 rays.

The pectoral is inserted under the first branched ray of the first dorsal; its length in the most nearly perfect specimens equals the length of the head without the snout.

The ventral origin very slightly behind origin of pectoral under the third branched ray of the dorsal, reaching nearly to the vent when laid back. Its length (35 millimeters) equaling three times that of snout. Rays 8. Branchiostegals 7.

Color, yellowish gray, lighter below.

The type specimen (Cat. No. 37339, U. S. N. M.), 305 millimeters in length, was taken by the *Albatross* from station 2396, in 28° 34′ N. lat., 86° 48′ W. lon., at a depth of 335 fathoms. The *Albatross* also obtained examples from station 2395, in 28° 36′ 15″ N. lat., 86° 50′ W. lon., at a depth of 347 fathoms; and from station 2376, in 29° 03′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms. The *Blake* captured a single individual at station CCLVI, in 28° 42′ N. lat., 88° 40′ W. lon., at a depth of 321 fathoms.

BATHYGADUS MELANOBRANCHUS, VAILLANT.

Bathygadus melanobranchus, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 206, pl. XVIII, fig. 1.

Body compressed, its greatest height (at ventrals) one-seventh of its length; its thickness one-eleventh of same. Length of head one-fifth of total. Snout blunt, its length one-fourth that of head. Mouth large, the maxillary extending to or beyond vertical from center of eye. Eye large, as long as snout; interorbital space very slightly less. No barbel.

Scales cycloid, unarmed, in about 24 horizontal and 140 transverse rows.

Distance of first dorsal from snout less than five times in the length of the specimen. Length of its second ray nearly twice that of snout. Second dorsal with 102 rays, nearly continuous with the first.

Anal inserted under the ninth ray of second dorsal (in *B. macrops* under the fourteenth). Its rays are short (one-half diameter of eye), rather far apart; in a space equal to the length of the head, counting backward from the insertion, there are 26 (33 in *B. macrops*).

Pectoral inserted under the first branched ray of the dorsal; its length equal to distance from center of eye to gill cleft.

Ventral base entirely in advance of vertical from origin of dorsal, and so far in advance of the pectoral that a vertical from the axil of the latter would touch the inner ventral ray about at its middle (as shown in Vaillant's figure). In *B. macrops* the ventral is behind the vertical from base of pectoral; its length is 1½ times that of the snout (in *B. macrops* 3 times.)

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[1] Not one of our specimens has scales, so their character can not be made out, nor can the lateral line be described.

Radial formula: D. IX+102; A. 97; V. 8.

Color, ruddy, silvery gray, with reflections; interior of mouth and branchial cavity black.

Ninety-six specimens of this form were obtained by the French vessels, off the coast of Morocco and Soudan and off the Canaries, in 834 to 1,590 meters.

It is similar to *B. macrops*, which, however, has a small barbel, more rays in its vertical fins, longer ventrals—set behind pectorals, instead of in advance of them—and anal set further back.

Family LYCONIDÆ.

Lyconidæ, GÜNTHER, Challenger Report, XXII, 1887, 158.

Body terminating in a long compressed tapering tail, covered with small scales. A continuous dorsal fin occupies the back to the extremity of the tail, but a division into two portions may be considered to be indicated by the prolongation of some of the anterior dorsal rays; anal long, extending from the vent to the end of the tail; no caudal; ventrals thoracic, composed of several rays. Pseudobranchiæ present; 4 gills; 7 branchiostegals.

Related to the *Macruridæ*, but to be considered as a more generalized type. (*Günther.*)

LYCONUS, Günther.

Lyconus, GÜNTHER, Challenger Report, XXII, 1887, 158 (type, *L. pinnatus*, *loc. cit.*, pl. XLII, fig. C).

Head and body compressed, the former composed of thin bones, but with narrow muciferous channels, except on the top between the eyes; trunk as long as or longer than the head; eye large; snout short; cleft of the mouth wide, terminal, both jaws armed with a series of widely set teeth, unequal in size; two in front of the upper jaw being canine-like but not so large as those of the lower jaw; vomer with a single canine-like tooth on each side. Scales very small, cycloid, deciduous. Gill-membranes not united. Barbel none. (*Günther.*)

This unique type of fishes is represented by a single specimen of the single species, *Lyconus pinnatus.*

LYCONUS PINNATUS, GÜNTHER.

Lyconus pinnatus, GÜNTHER, Challenger Report, XXII, 1887, 158, pl. 42, fig. C.

Head compressed, as deep as it is long, without snout. The interorbital space is rather flat, narrower than the round eye, which lies immediately below the upper profile; its diameter is one-third of the length of the head and rather longer than the snout. The mouth ascends obliquely forward, and extends behind the middle of the orbit; the jaws are even in front. The teeth are but few in number, and besides the two long lateral fangs there are only three shorter ones developed in the lower jaw. Opercular bones very thin, and the infraorbitals narrow, separating the maxilla from the eye by a narrow space only.

The distance of the vent from the root of the ventrals is rather more than the length of the head. The tail tapers into an exceedingly fine filament.

The dorsal fin commences above the base of the pectoral, and is composed of very delicate simple rays; there is no break in its continuity, but some of its anterior rays, perhaps 3 or 4, are much prolonged, but as this portion is injured, no more precise information can be given. The anal fin commences immediately behind the vent, and its rays are considerably shorter than those of the dorsal. The pectoral has a narrow base, and is directed obliquely upward; it consists of thirteen rays, and is exceedingly elongate, the middle rays extending far beyond the vent.

The ventral fins are mutilated; they are composed of 10 rays and situated below the base of the pectoral.

Scales very small, thin, and deciduous.

The total length of the specimen is 59 lines, of which the head makes 7, and the head and trunk together 17.

This species was picked up in mid-ocean in the South Atlantic, and was purchased by the British Museum from the Godeffroy Collection.

Order HETEROSOMATA.

Cranium posteriorly normal; anteriorly with twisted vertex, to allow two orbits on the same side, or one vertical and one lateral; basis cranii not quite simple. Dorsal fin long, of jointed rays. Superior pharyngeals 4, the third longest, much extended forward, the inferior separate. (*Cope.*)

Family PLEURONECTIDÆ.

I Pleronetti, RAFINESQUE, Indice d' Ittiologia Siciliana, 1810, 14.

Pleuronectidæ, FLEMING, British Animals, 1828, 178.—BONAPARTE, Catalogo Metodico dei Pesci Europei, 1846, 47.—SWAINSON, Nat. Hist. Fishes, etc., 1839, II, 187.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 399.—GILL, Arr. Fam. Fish., 1872, 2, (No. 15).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 813.

Pleuronecteoidei, BLEEKER, Tentamen, 1859, XV.

Body strongly compressed, more or less oval or rhomboid, and with one of its sides (which is upward when the animal is reclining on its side) colored, and the other (which is downward) generally colorless; the scales are variously developed (sometimes ctenoid, sometimes cycloid, and sometimes wanting); the lateral line is continuous behind; the head compressed, more or less rhomboid, and with the snout pointed; both eyes are on the same side, one being on or near the forehead, the other comparatively low down; opercula normal, unarmed, not concealed by skin; mouth terminal, and with an oblique lateral cleft and of various extent; branchial apertures continuous below; branchiostegal rays 5 to 8; dorsal elongated, extending generally from about the rostral region to near the caudal fin; anal fin also elongated, and extending about as far back as the dorsal; both are composed almost solely of articulated rays; caudal fin distinct from the dorsal and anal; pectorals on both sides; ventrals jugular. The skeleton has numerous vertebræ; pyloric cæca are generally developed, but in small number.

KEY TO THE SUBFAMILIES AND DEEP-SEA GENERA OF PLEURONECTIDÆ.

(From Gill & Jordan, modified.)

I. Mouth small; supramaxillary ending before or under front of eye; teeth largest on blind side. *Pleuronectinæ*
  A. Teeth in one series.
    1. Teeth rather large, bluntish or trenchant; eyes dextral (sometimes sinistral in one species); ventrals (usually) both lateral.
      a. Dorsal fin with less than 80 rays; anal with less than 60. Eyes dextral.
        Lateral line not arched. Scales not imbricated, usually ctenoid in male, cycloid in female. PLEURONECTES
        Lateral line arched anteriorly. Scales ctenoid.................................LIMANDA
      b. Dorsal fin with more than 95 rays; anal with more than 80; body unusually elongate.
        Left side of skull with strong mucous cavities. Lateral line nearly straight. Anal spine present. Eyes dextral.................................GLYPTOCEPHALUS
        Mucous cavities not present. Caudal subsessile; left pectoral only present; lateral line present, arched on eyed side, straight on blind side. Eyes sinistral. MONOLENE
II. Mouth large, supramaxillaries end under eye; ventrals lateral; vomer and palatines toothless. *Hippoglossinæ*
  A. Caudal fin lunate.
    1. Lateral line arched in front; scales cycloid.................................HIPPOGLOSSUS
    2. Lateral line not arched.
      a. Teeth not arrow-shaped; gill-rakers few, short.........................PLATYSOMATICHTHYS
  B. Caudal fin not lunate, the middle rays produced.
    1. Lateral line arched in front; body usually sinistral.
      a. Dorsal fin single.................................PARALICHTHYS
      b. Dorsal in two parts, its anterior rays, as well as sinistral ventral, much prolonged. Scales ctenoid.................................NOTOSEMA
    2. Lateral line not arched. Body dextral.................................HIPPOGLOSSOIDES

III. Mouth large; teeth nearly equally developed on both sides of the mouth. Ventral fin of the left side inserted nearly on the ridge of the abdomen. Body sinistral.

Psettinæ

A. Septum of gill cavity between gill arches and the termination of the shoulder-girdle with a large foramen; the emargination below the shoulder-girdle near the isthmus not deep; lateral line with a strong arch in front; last rays of dorsal and anal inserted more or less on the right side of the median line; teeth subequal in bands.

1. Vomer with teeth.

a. Ventral of eyed side united to the anal; scales small, very rough; body ovate. [ZEUGOPTERUS]

b. Ventral fins free from the anal; scales ciliated, deciduous; body oblong, much compressed. LEPIDORHOMBUS

B. Septum of gill cavity below gill arches, without foramen; a deep emargination nearer the isthmus; ventral fins free from anal.

1. Pectoral fin of both sides present; dorsal rays less than 100.

a. Vomer toothless; ventral fins free from anal; caudal fin subsessile.

i. Lateral line with a distinct arch in front; teeth small, uniserial, or imperfectly biserial.

* Interorbital area a narrow ridge, sometimes with a median groove.

† Scales weakly ciliated or cycloid, deciduous; vertebræ 10 + 28 = 38; supramaxillaries with a posterior process from the lower angle.......... [ARNOGLOSSUS]

†† Scales strongly ctenoid, adherent; supramaxillaries obliquely truncated behind. TRICHOPSETTA

** Interorbital space more or less broad, deeply concave; scales small, ctenoid, adherent; body ovate (pectoral of left side usually filamentous in the male); vertebræ 9 + 30 = 39.. PLATOPHRYS

ii. Lateral line without arch in front; scales ciliated. Teeth in both jaws uniserial; interorbital space very narrow, the ridges coalescing between the eyes.

* Mouth not very small, the maxillary more than one-third length of head.

† Gill-rakers slender, of moderate length; scales thin, deciduous, ciliated; vertebræ 34 to 40.

a. Head much compressed, with the interorbital region flat and level with the eye .... CITHARICHTHYS

** Mouth very small, the maxillary less than one-third length of head........ ETROPUS

iii. Lateral line without arch in front; scales cycloid. Teeth in both jaws uniserial, of lower enlarged and largest on sides.............................. CYCLOPSETTA

2. Pectoral fin of blind side wanting.

A. Teeth small, uniserial; mouth moderate.

1. Lateral line of eyed side arched, that of right side less so or nearly straight.

a. Dorsal fin beginning on snout, its anterior rays not exserted, its rays all simple and very numerous; scales small; body thin, very elongate................ MONOLENE

LIMANDA, Gottsche.

Limanda, GOTTSCHE, Wiegmann's Archiv., 1825, 100.—JORDAN and GILBERT (as subgenus), Bull. XVI, U. S. Nat. Mus., 834.

Nematops, GÜNTHER, Challenger Report, VI, 57; XXII, 166 (type, *N. microstoma, loc. cit.*, VI, 57, pl. XXIV, fig. C).

A group of pleuronectoid fishes closely related to, if not a subdivision of, the genus *Pleuronectes;* having ctenoid scales, a lateral line strongly arched in front, and without an accessory branch.

The type, *Pleuronectes limanda,* Linnæus (= *Limanda vulgaris,* Gottsche) is found along the coasts of Europe from Iceland to the Gulf of Gascony. The British fishermen take it on their deep-sea lines, and it no doubt descends below the hundred-fathom line, especially in summer.

Limanda microstoma, (Günther), is from the Admiralty Islands, at a depth of 152 fathoms.

LIMANDA FERRUGINEA, (STORER), GOODE AND BEAN.

Platessa ferruginea, STORER, Hist. Fish. Mass. 1867, p. 198, pl. XXX, fig. 4.

Myzopsetta ferruginea, GILL, Cat. Fish E. Coast N. A. 1861, 51 (genus not defined); Proc. Acad. Nat. Sci. Phil. 1864, 217 (genus defined), *et alibi.*

Pleuronectes ferruginea, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 447.—JORDAN & GILBERT, Bull. XVI, U. S. Nat. Mus, 834.

Limanda ferruginea, GOODE & BEAN, Cat. Fish. Essex Co. and Mass. Bay, 1879, 6.—GOODE, Proc. U. S. Nat. Mus., III, p. 473.
Platessa rostrata, H. R. STORER, Boston Journ. Nat. Hist., v, 1857, 268, pl. viii, fig. 2.
Myzopsetta rostrata, GILL, *loc. cit.*

Body strongly compressed, its height 2¼ times in its length. Length of head one-fourth that of body; snout projecting, forming a strong angle above upper eye with the descending profile. Teeth conical, closely set, in a single series, on jaws. Gill-rakers moderate, weak, not toothed. Diameter of eye two-thirds of length of head; the lower eye slightly in advance of upper; separated from it by a high, narrow ridge, scaled posteriorly and continuing backward to beginning of lateral line. Scales imbricated: those on right ctenoid, on left, nearly smooth. Lateral line simple, with low arch, whose depth is less than two-fifths its length, containing about 100 scales.

Caudal peduncle short, higher than long. Dorsal origin over middle of eye, its middle rays longest; pectoral less than two-fifths as long as head; caudal fin rounded; a strong anal spine. Concealed spine behind ventrals; ventrals of colored side partly lateral, that of white side wholly so.

Radial formula: D. 80–85; A. 58–62.

Color, body and fins of right side brownish olive, with irregular, rusty spots; caudal fin, caudal peduncle, and margins of dorsal and anal fins lemon yellow on the left side.

Specimens from the far North, as described by Storer (*P. rostrata*), are rounder in outline, have fewer rays in the vertical fins and a blunter, more prominent snout, and may perhaps sometime be recognized as belonging to a distinct subspecies.

This species is found inshore on the New England coast in winter, but in summer retreats to deep, cold water. Numerous specimens were taken by the *Fish Hawk* in 1874, 1875, and 1880, south of Cape Cod, in deep water. The most southern locality at that time found was the Pecten ground off Watch Hill, Rhode Island. Examples were obtained from station 984, in 41° 31′ N. lat., 60° 28′ W. lon., at a depth of 33 fathoms; Cat. No. 28821, U. S. N. M., from station 948, off Penikese Island, Buzzard's Bay, in 7 fathoms; and Cat. No. 28818, U. S. N. M., from station 927, in Vineyard Sound, at a depth of 11 fathoms. The *Albatross* secured specimens from station 2440, in 43° 38′ N. lat., 49° 49′ 30″ W. lon., at a depth of 33 fathoms; Cat. No. 33425, U. S. N. M., from station 2082, in 41° 09′ 50″ N. lat., 66° 31′ 50″ W. lon., at a depth of 49 fathoms; and Cat. No. 33416, U. S. N. M., from station 2058, in 41° 57′ 30″ N. lat., 67° 58′ W. lon., at a depth of 35 fathoms; and the *Speedwell*, from station 57, in Halifax Harbor, at a depth of 16 fathoms; from station 75 in Halifax Harbor, and Cat. No. 24626, U. S. N. M., from station 196, off Thatcher's Island, in 29 fathoms. A single individual (Cat. No. 23767, U. S. N. M.) was also taken at Provincetown, Mass., on July 29, 1879.

LIMANDA BEANII, GOODE. (Figures 355, A, B, adult; C, D, young.)

Limanda Beanii, GOODE, Proc. U. S. N. M., III, sig. 30, 473, Feb. 16, 1881.
Pleuronectes Beanii, JORDAN & GILBERT, Bull. XVI, U. S. N. M., 835.—JORDAN, Cat. Fish. N. Amer., 1885, 136.—GÜNTHER, Challenger Report, XXII, 166.

Body elliptical, with angular outlines. Its height is three-eighths of its length, and slightly more than twice length of head. Its height at the ventrals (25) is one-fourth of its length and less than distance from snout to origin of anal. Its least height, at base of tail (12), is half its height at ventrals. The body is thin, its greatest width (7) not exceeding the diameter of the orbit.

Scales subcircular, small, strongly pectinate on the colored side, cycloid on the blind side, where they are also larger, there being about fifty in the lateral line (behind the curve), while on the colored side there are probably sixty. The lateral line on the colored side makes a very abrupt, conspicuous, angular, high curve over the pectoral fin. The chord of this arc is nearly as long as the head of the fish, its height half as great. The scales in the lateral line are highly specialized, particularly along the curve, which appears to contain about twenty-seven of them, while posterior to this, in the straight portion, there are about sixty. The specialized scales of the lateral line extend far out upon the caudal fin. On the blind side the lateral line is little conspicuous, the scales very slightly specialized, and it becomes obsolete in the region where, upon the colored side, the curve is located. The scales extend far out upon the caudal fin, but are not present upon the other fins.

Head very short, its length (18) contained about five times and one-half in the total. The snout is very short (2), one-fiftieth of the total, and the mouth is small, its cleft subvertical, and the maxillary extending very slightly behind the anterior margin of the orbit. The teeth are inconspicuous, apparently in two rows, stronger and more numerous on the blind side, barely discernable in upper jaw, absent elsewhere in the mouth.

Eyes large, prominent; their diameters (7) greater than the length of the maxillary (6) and equal to that of the mandible (6). They are very closely set, the interorbital space marked by a knife-like edge of bone. The upper eye, in its outline trenching upon the dorsal outline of the head, is almost directly above its mate. Together they occupy nearly three-fourths of the width of the head at the perpendicular passing through their centers.

The dorsal fin begins over the posterior part of the pupil of the upper eye. Its rays are long, widely separated, and with their tips protruding beyond the membrane, giving to this, as also to the anal, a ragged, irregular appearance. Its greatest height (8) is equal to half the length of the head. The anal is inserted under the axil of the pectoral, and its height is about the same as that of the dorsal.

The length of the caudal (20) is equal to one-fifth of that of the body, without including caudal. It is broad, fan-shaped, acutely convex in outline. The distance of the ventral from the snout (28) is about one-third the length of the base of the dorsal. The arrangement of these fins upon the ventral keel is much as in *Limanda ferruginea*, the right fin being almost upon the median line. The pectorals are normal.

The color is grayish brown, mottled with darker patches. There is a conspicuous black blotch upon the outer rays of the caudal on either side.

Radial formula: D. 63–68; A. 54–56; C. 18; P. 7; V. 6; lateral line about 88; 27 in curve.

The extreme brevity of the snout and the elongate-elliptical form of the body render its shape very unlike that of *Limanda ferruginea* of our own coast and *Limanda platessoides* of the Eastern Atlantic. In its general appearance, however, except that the ventrals are not both lateral, it resembles considerably the species mentioned above.

MEASUREMENTS.

Current number of specimen	26102.	
Locality	Stations 875–876.	
	Millimeters.	100th of length.
Extreme length	135	
Length to base of middle caudal rays	111	100
Body:		
Greatest height		38
Greatest width		7
Height at ventrals		25
Least height of tail		12
Head:		
Greatest length		18
Width of interorbital area		5
Length of snout		2
Postorbital portion of head		9
Length of maxillary		6
Length of mandible		7
Diameter of orbit		7
Dorsal:		
Distance from snout		9
Length of base		83
Greatest height		8
Anal:		
Distance from snout		28
Length of base		70
Caudal: Length of middle rays		20
Pectoral:		
Distance from snout		17
Length		9
Ventral:		
Distance from snout		17
Length		9

The type specimens (Cat. No. 26102, U. S. N. M.) were taken by the *Fish Hawk* from station 875, in 39° 57′ N. lat., 70° 57′ 30″ W. lon., at a depth of 126 fathoms, and from station 876, in 39° 57′ N. lat., 70° 56′ W. lon., at a depth of 120 fathoms. The *Albatross* secured examples from station 2398, in 28° 45′ N. lat., 86° 26′ W. lon., at a depth of 227 fathoms; from station 2399, in 28° 44′ N. lat., 86° 18′ W. lon., at a depth of 196 fathoms; from station 2143, in 9° 30′ N. lat., 76° 25′ W. lon., at a depth of 896 fathoms; from station 2400, in 28° 41′ N. lat., 86° 07′ W. lon., at a depth of 169 fathoms; from station 2401, in 28° 38′ 30″ N. lat., 85° 52′ 30″ W. lon., at a depth of 142 fathoms; and from station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms. The *Blake* obtained individuals from station XV, off St. Kitt's, in 208 fathoms, and station XXII, off St. Kitt's, in 250 fathoms.

GLYPTOCEPHALUS, Gottsche.

Glyptocephalus, Gottsche, Archiv für Naturg., I, 1835, 156.—Bleeker, Comp. Rend. Acad. Sci. Amsterdam, XIII.—Gill, Proc. Acad. Nat. Sci. Phila., 1873, 360.—Goode and Bean, Proc. U. S. Nat. Mus., I, 19.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 837.

Dextral pleuronectoids with body elongate, greatly compressed. Head small and short, with many sinuses and mucous cavities in skull, as well as on mandible and preopercle on blind side. Mouth very small; teeth in single series, moderate, incisor-like, equal, close set; vomer and palatines toothless. Gill rakers short, weak. Lower pharyngeals narrow, with 1 or 2 rows of conical teeth. Lateral line simple, nearly straight; scales smooth, small. Dorsal and anal fins elongate, with more than 90 rays in the dorsal and more than 80 in the anal; caudal rounded; an anal spine.

GLYPTOCEPHALUS CYNOGLOSSUS, (Linnæus), Gill. (Figures 356 A, B.)

Pleuronectes oculis a dextris totus glaber, Artedi, Gen. 11, N. 3; Mus. Ichth. No. 39; Synon. 31, No. 3.

Pleuronectes cynoglossus, Linnæus, Syst. Nat., ed. X, I, 1758, 269; ed. XII, 1766, I, 456.—Günther, Cat. Fish. Brit. Mus.. IV, 1862, 449; Challenger Report, XXII, 1887, 166.—Day, Fishes of Great Britain and Ireland, II, 30, pl. CIII.

Glyptocephalus cynoglossus, Gill, Proc. Acad. Nat. Sci. Phila., 1873, 61.—Goode and Bean, Proc. U. S. Nat. Mus., I, 19; Bull. Essex Inst., XI, 1879, 6; Bull. Mus. Comp. Zool., X, 1883, 195.—Jordan and Gilbert, *loc. cit.*—Goode, Proc. U. S. Nat. Mus., III. 475.—Collett, Norske Nord-Havs Exped., Fiske, 150; Forhandl. Vidensk. Selsk. Christiania, 1880, 82.—Ström, Norsk. Vidensk. Selsk. Skrift., 1884, 39.

Platessa cynoglossus, Moreau, Hist. Nat. Poiss. France, III, 296.

Pleuronectes pola, Lacépède, Hist. Nat. Poiss. (Suites à Buffon), 1819, IV, 401.

Platessa pola, Cuvier.—Parnell, Nat. Hist. Fish. Frith of Forth, 1838, 210, pl. XXXVIII.—Yarrell, Hist. Brit. Fish., 1841, II, 315.—Couch, Fishes British Islands, III, 1864, 190.

Pleuronectes saxicola, Faber, Isis, 1828, 877.

Glyptocephalus saxicola, Gottsche, *loc. cit.*

Pleuronectes nigromanus, Nilsson, Prodr. Ichth. Scand., 1832, 55.

Platessa elongata, Yarrell, *op. cit.* 318.—Günther, *op. cit.* 450.—Couch, *op. cit.* 193.

Glyptocephalus elongatus, Gill, *op. cit.* 362.

Glyptocephalus acadianus, Gill, *op. cit.* 361, and in Baird's Report on Fisheries of South Coast of New England, 1873, 794.

A *Glyptocephalus*, having the height of body 3 times (more or less) in its own length; the length of the head about 5½ times. Scales small; head scaly, except on snout and ridge between the eyes. Lateral line straight. Snout shorter than diameter of orbit, which is one-fourth of length of head. Jaws subequal in front, the maxillary shorter than the eye. Upper jaw with truncated incisor-like teeth on the blind side, in a close-set series of about 20. Eyes separated by a sharp ridge, the lower somewhat in advance. Origin of dorsal fin about middle of eye, its distance from caudal somewhat less than half depth of caudal peduncle. Middle dorsal rays longest, more than half as long as head; pectoral half as long as head.

Radial formula: D. 102—120; A. 87—102; L. lat. 125; Vert. 58.

Color, grayish-brown; membranes of the fins with dark spots; pectoral of the colored side dark.

The pole-flounder is a well-known cold-water fish of Europe. It was obtained by Ström in the Trondhjem Fiord at 200 fathoms, and by the Norwegian Expedition at 125–250 fathoms off Finmark and the Lofoten Islands.

It occurs also in the North Sea and around the British Islands, and France where, however, it is rare, especially on the west coast, though it has been found as far south as Arcachon.

On our own coast, though never found near the shore, it is one of the most abundant of the deep-water pleuronectoids.

The following statistics are the result of a careful study of numerous specimens trawled in the deep water off Salem, Mass., on La Have Bank, and on the coast of Nova Scotia, off Halifax, in Halifax Harbor, and in Bedford Basin, Halifax. They are the result of detailed measurements of 22 individuals, including authentically named European specimens from the University of Christiania, and the Bonaparte Collection, the type of *G. acadianus*, 3 specimens from Massachusetts Bay, 5 from La Have Bank, and 11 from the vicinity of Halifax.

(1) *Height of body.*—This is stated to be about 2⅜ of length exclusive of caudal, and 3¼ in total length. In the series studied, the proportions of this element varied, stated in units of hundredths of total length (including caudal), from 0.245 to 0.375, No. 12685 having it 30. An equally wide variation in the European fish is recorded by Parnell.[1]

The *Pleuronectes elongatus* of Yarrell is not nearly so elongated as No. 21061*a* (the figure of Couch has height about 0.275); and since no other diagnostic characters have been described, we place it without hesitation in the synonymy of *G. cynoglossus*.

(2) *Height of caudal peduncle.*—This element is subject to very slight variation, measuring usually 0.07 of total in both European and American specimens. The most elongate slender forms have it slightly narrower. In No. 12685 it measures 0.06, and 0.065 in No. 21001*b*.

(3) *Length of head.*—This varies from 0.15 to 0.175. In No. 12685 the length is 0.15, and in the European specimens 0.15 and 0.1575 (Christiania specimen). The smallest proportion is represented by specimens from Massachusetts Bay and Halifax.

(4) *Teeth.*—In number these are extremely variable. No. 12685, according to Gill, had on the blind side 17 above and 20 below, on the eyed side 6 above and 7 below. A Salem specimen, larger and older, had on the blind side above 26, below 28, on the eyed side above 13, below 14. In young individuals the teeth present the characters described by Gill, having the teeth on the eyed side conical and separated. This peculiarity disappears with age, all large specimens showing closely set incisorial teeth upon both sides of each jaw.

(5) *Length of pectoral.*—This is extremely variable within limits of 0.09 and 0.14. This measurement refers to the fin upon the colored side. Its shape is also variable; it is sometimes pointed, sometimes obtuse, owing to difference in comparative length of the upper rays. It is usually black, with a narrow whitish tip. The number of rays varies from 9 to 14.

(6) *Length of ventrals.*—This is also extremely variable on both sides. The range on the blind side is 0.0475 to 0.07, and on the eyed side 0.056 to 0.0775. The difference between the length of the two fins upon the same individual varies from 0.0025 to 0.0155.

(7) *Contour of lateral line.*—In some individuals this is essentially straight, in others considerably arcuated above the pectoral. This appears to be an individual variation. The two European specimens show a perceptible difference in this respect. In his diagnosis of *Pleuronectes cynoglossus*, Dr. Günther states that the lateral line is straight without curve.

(8) *Position of the eyes.*—Dr. Günther states that in *P. elongatus* the upper eye is in advance of the lower. This is doubtless quoted from Yarrell. Neither the figure of Yarrell nor that of Couch indicates any such character.

(9) *Scales in lateral line.*—The number on the blind side ranges from 109 to 150, on the eyed side from 110 to 140, there being no relation between the different sides of the same fish.

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[1] Fishes of the Firth of Forth, p. 210, pl. XXXIII, and in Memoirs of the Wernerian Society, VII, p. 370.

(10) *Radial formula.*—In the dorsal this ranges from 102 to 120; in the anal from 87 to 100. There is no apparent relation between the number of rays and the relative proportions of height and length of body. A large number of rays in the dorsal is usually accompanied by a relatively large number in the anal.

(11) *Transverse rows of scales.*—Their number above and below the lateral line is nearly equal. The range is about from 40 to 50. There appears to be no relation of number of transverse rows to comparative height of body.

The thermal range of the species appears to be defined nearly by the limits 34° and 45° F.

Dr. Günther suggests that the fish first cited by Fabricius (*Fauna Grœnlandica*, p. 163), under the name of *Pleuronectes cynoglossus*, and subsequently named by him *Pleuronectes pinguis* (Afhandling, Kongel. Danske Videnskabernes Selskabs, Naturvid. og Math., Copenhagen, vol. I, 1824, p. 45), is probably identical with this species. The true relations of the Greenland fish have already been pointed out by Professor Gill (Proc. Acad. Nat. Sci. Phila., 1864, p. 218), as well as the curious misapprehension by which the synonymy of *P. pinguis* and the halibut has been confounded.

The following tables give detailed measurements of 23 specimens:

MEASUREMENTS.

Current number of specimen	10,068	17,355	21,000 *a*	21,000 *b*	21,000 *c*	12,685	21,001 *a*	21,001 *b*	21,001 *c*	21,001 *d*	21,001 *e*
Locality	Europe, Bonaparte coll.	Christiania, Swedish coll.	Massachusetts Bay.	Massachusetts Bay.	Massachusetts Bay.	Eastport.	LaHave.	LaHave.	LaHave.	LaHave.	LaHave.
	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.
Extreme length, in inches	15.75	15.15	17.25	19	23	9.5	9 9	10.2.	11.5	12	12.25
Body:											
Greatest height	0.315	0.33	0.34	0 325	0.34	0.30	0.307	0.295	0.299	0.33	0.325
Least height of tail	0.07	0.07	....	....	....	0 06	....	0.065	....	....	....
Head.											
Greatest length	0.15	0.156	0.155	0.15	0.165	0.05	0.16	0.16	0.16	0.165	0.16
Length of maxillary	0.035	0.0375	....	....	....	0.035	....	0.04	....	....	....
Length of mandible	0.05	0.05	....	....	....	0.05	....	0.06	....	....	....
Diameter of orbit	0.05	0.05	....	....	....	0.05	....	....	....	....	....
Pectoral:											
Distance from snout	0.16	0.16	....	....	....	0 16	....	....	....	....	....
Length	0.09	0.105	....	....	....	0.10	....	....	....	....	....
Ventral											
Distance from snout	(0.19)	0.18	....	....	....	0.17	....	....	....	....	....
Length (blind side)	0.05	0.056	....	0.051	0.055	0.06	0.052	0.052	0.047	....	0.055
(eyed side)	0.056	0.062	....	0.057	0.057	0.065	0.065	0.065	0.058	....	0.065
Dorsal	112	103	112	110	110	107	101	115	110	107	113
Anal	99	87	90	93	91	96	87	97	95	88	98
Pectoral	11	11	12	11	13	12	11	11	11	12	13
Ventral	6	6	6	6	6	6	6	6	6	....	6
Number of scales in lateral line (blind side)	117	114	150	138	136	128	113	112	130	115	117
(eyed side)	115	116	140	133	134	118	117	119	128	110	117

Current number of specimen	21,005 *a*	21,005 *b*	21,017	21,047 *a*	21,047 *b*	21,010 *a*	21,019 *b*	21,019 *c*	21,019 *d*	21,019 *e*	21,032	21,061 *a*
Locality	Halifax.	Halifax.	Halifax	Halifax.	Halifax.	Halifax.	Halifax.	Halifax.	Halifax.	Halifax.	Halifax.	Halifax.
	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.	100ths.
Extreme length, in inches	15.75	19	16.25	19	24 25	21.5	19	20	20.25	19	19.25	114 *mm.*
Body:												
Greatest height	0.37	0 35	0.336	0.32	0.37	0.365	0.375	0.316	0.33	0.34	0.365	0.245
Least height of tail	....	....	....	....	....	0.07	0.07	....	....	....	....	0.055
Head:												
Greatest length	0.155	0.155	0.157	0.155	0.175	0.16	0.156	0.152	0.155	0.15	0.175	0.165
Length of maxillary	....	....	....	....	....	0.03	0.03	....	....	....	....	0.045
Length of mandible	....	....	....	....	....	0.05	0.05	....	....	....	....	0.06
Diameter of orbit	....	....	....	....	....	0.05	0.05	....	....	....	....	0.06
Pectoral:												
Distance from snout	....	....	....	....	....	0.157	0.160	....	....	....	....	0.17
Length	....	....	....	....	....	0.14	0.11	....	....	....	....	0.08
Ventral:												
Distance from snout	....	....	....	....	....	0.17	0.17	....	....	....	....	0.20
Length (blind side)	0.053	0.047	0.055	0.057	0.047	0.07	0.057	0.065	0.055	0.05	0.067	0.055
(eyed side)	0.062	0.063	0.06	0.063	0.06	0 077	0.067	0.075	0.06	0.06	0.077	0.055
Dorsal	105	120	106	111	106	109	113	106	114	102	106	104
Anal	92	100	90	95	92	98	99	91	97	87	90	87
Pectoral	12	11	12	10	12	12	11	11	11	11	11	14
Ventral	6	6	6	6	6	6	6	6	6	6	6	6
Number of scales in lateral line (blind side)	109	133	125	127	117	117	130	132	131	119	129	....
(eyed side)	115	127	128	125	122	121	130	117	127	115	125	....

CATALOGUE OF SPECIMENS IN NATIONAL MUSEUM.

Catalogue number.	Number of specimens.	Locality.	When collected.	From whom received.	Nature of specimen.
21000	13	Massachusetts Bay, off Salem	Aug. —, 1877	United States Fish Commission.	
21001	11	La Have Bank	do	do	
21005	2	Halifax	do	do	
21017	3	27 miles south by west from Chebucto Head	Sept. 6, 1877	do	
21019	20	Halifax	Sept. 4, 1877	do	
21032	1	do	Sept. 11, 1877	do	
21047	2	Halifax (trawl 113 and 114)	Sept 24, 1877	do	
21056	4	Massachusetts Bay	Aug 6, 1877	do	Young.
21057	1	do	do	do	Do.
21058	2	Massachusetts Bay (trawl 32, 90 fathoms)	Aug. 14, 1877	do	Do.
21059	1	Halifax (trawl 54)	Aug. 25, 1877	do	Do.
21060	1	Halifax (trawl 44)	Aug. 21, 1877	do	Do.
21061	8	27 miles off Chebucto (trawl 85)	Sept. 6, 1877	do	Do.
21062	1	Halifax (trawl 106, 111 fathoms	Sept. 20, 1877	do	Do.
21063	1	Bedford Basin (trawl 111, 37 fathoms)	Sept. 21, 1877	do	
10068	1	Europe		Bonaparte collection	
17355	1	Christiania, Norway		Norwegian Government	
12685	1	Eastport, Me	Aug. —, 1872	United States Fish Commission	

A single specimen of the pole flounder was obtained by the *Blake* from station 343, 39° 45′ 20″ N. lat., 70° 55′ W. lon., in 732 fathoms. The occurrence of this species at such immense depths is noteworthy, since the Fish Commission in the same year obtained it at a depth of 120 fathoms, in almost the same latitude, and within one minute of the same longitude (station 876). Specimens were also taken by the *Blake* from station CCCXXXIV, in 38° 20′ 30″ N. lat., 73° 26′ 40″ W. lon., at a depth of 395 fathoms; from station CCCXXXII, in 35° 45′ 30″ N. lat., 74° 48′ W. lon., at a depth of 263 fathoms; from station CCCXXIX, in 34° 39′ 40″ N. lat., 75° 14′ 40″ W. lon., at a depth of 603 fathoms; and from station CCCXXII, in 35° 45′ 30″ N. lat., 74° 48″ W. lon., at a depth of 263 fathoms.

The *Albatross* secured examples from station 2528, in 41° 47′ N. lat., 65° 37′ 30″ W. lon., at a depth of 677 fathoms; from station 2110, in 35° 12′ 10″ N. lat., 74° 57′ 15″ W. lon., at a depth of 516 fathoms; from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; from station 2292, in 35° 27′ 20″ N. lat., 75° 16′ 30″ W. lon., at a depth of 17 fathoms; from station 2532, in 40° 31′ 30″ N. lat., 66° 48′ W. lon., at a depth of 705 fathoms; from station 2470, in 44° 47′ N. lat., 56° 35′ 45″ W. lon., at a depth of 224 fathoms; from station 2499, in 44° 46′ 30″ N. lat., 59° 55′ 45″ W. lon., at a depth of 130 fathoms; from station 2424, in 36° 41′ 37″ N. lat., 71° 42′ 15″ W. lon., at a depth of 85 fathoms; from station 2171, in 37° 59′ 30″ N. lat., 73° 48′ 40″ W. lon., at a depth of 444 fathoms; from station 2553, in 39° 48′ N. lat., 70° 36′ W. lon., at a depth of 551 fathoms; from station 2513, in 43° 34′ N. lat., 63° 56′ 30″ W. lon., at a depth of 134 fathoms; from station 2505, in 44° 23′ 30″ N. lat., 61° 44′ 15″ W. lon., at a depth of 93 fathoms; from station 2560, in 39° 48′ 10″ N. lat., 71° 48′ 40″ W. lon., at a depth of 114 fathoms; from station 2423, in 37° 10′ 15″ N. lat., 74° 32′ W. lon., at a depth of 143 fathoms; from station 2546, in 39° 53′ 30″ N. lat., 70° 17′ 30″ W. lon., at a depth of 538 fathoms; from station 2561, in 39° 38′ N. lat., 71° 42′ W. lon., at a depth of 500 fathoms; from station 2556, in 39° 52′ 15″ N. lat., 71° 32′ W. lon., at a depth of 180 fathoms; from station 2547, in 39° 54′ 30″ N. lat., 70° 20′ W. lon., at a depth of 390 fathoms; from station 2549, in 39° 51′ 30″ N. lat., 70° 17′ W. lon., at a depth of 571 fathoms; from station 2552, in 39° 47′ 07″ N. lat., 70° 35′ W. lon., at a depth of 721 fathoms; Cat. No. 32814, U. S. N. M., from station 2018, in 37° 12′ 22″ N. lat., 74° 20′ 04″ W. lon., at a depth of 788 fathoms; Cat. No. 33467, U. S. N. M., from station 2067, in 42° 15′ 25″ N. lat., 65° 48′ 40″ W. lon., at a depth of 122 fathoms; Cat. No. 35484, U. S. N. M., from station 2186, in 39° 52′ 15″ N. lat., 70° 55′ 30″ W. lon., at a depth of 353 fathoms; Cat. Nos. 35549 and 35550, U. S. N. M., from station 2202, in 39° 38′ N. lat., 71° 39′ 45″ W. lon., at a depth of 515 fathoms; Cat. No. 35449, U. S. N. M., from station 2183, in 39° 57′ 45″ N. lat., 70° 56′ 30″ W. lon., at a depth of 195 fathoms; Cat. No. 33587, U. S. N. M., from station 2086, in 40° 05′ 05″ N. lat., 70° 35′ W. lon., at a depth of 69 fathoms; Cat. No. 33384, U. S. N. M., from station 2072, in 41° 53′ N. lat., 65° 35′ W. lon., at a depth of 858 fathoms; Cat. No. 32680, U. S. N. M., from station 2003, in 37° 16′ 30″ N. lat., 74° 20′ 36″ W. lon., at a depth of 641 fathoms; Cat. No. 33554, U. S. N. M., from station 2092, in 39° 58′ 35″ N. lat., 71° 00′ 30″ W. lon., at a depth of 197 fathoms; Cat. No. 32654, U. S. N. M., from station 2003, in 37° 16′ 30″ N. lat., 74° 20′ 36″ W. lon., at a depth of 641 fathoms; Cat. No. 33475, U. S. N. M., from station 2064, in 42° 25′ 40″ N. lat., 66° 08′ 35″ W. lon., at a depth of 122 fathoms; Cat. No. 35410, U. S. N. M., from station 2179, in 39° 30′ 10″ N. lat., 71° 50′ W. lon., at a depth of 510 fathoms; Cat. No. 35697, U. S. N. M., from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms; Cat. No. 35460, U. S. N. M., from station 2187, in 39° 49′ 30″ N. lat., 71° 10′ W. lon., at a depth of 420 fathoms.

Specimens were also obtained by the *Fish Hawk* from the following localities: From station 1154, in 39° 53′ 31″ N. lat., 70° 39′ W. lon., at a depth of 193 fathoms; Cat. No. 28915, U. S. N. M., from station 994, in 39° 40′ N. lat., 71° 30′ W. lon., at a depth of 368 fathoms; Cat. No. 28785, U. S. N. M., from station 937, in 39° 49′ 25″ N. lat., 69° 49′ W. lon., at a depth of 616 fathoms; Cat. No. 26725, U. S. N. M., from station 898, in 37° 24′ N. lat., 74° 17′ W. lon., at a depth of 300 fathoms; Cat. No. 28845, U. S. N. M., from station 951, in 39° 57′ N. lat., 70° 31′ 30″ W. lon., at a depth of 225 fathoms; Cat. No. 31869, U. S. N. M., from station 1155, in 39° 52′ N. lat., 70° 30′ W. lon., at a depth of 554 fathoms; Cat. No. 26729, U. S. N. M., from station 897, in 37° 25′ N. lat., 74° 18′ W. lon., at a depth of 157½ fathoms: Cat. No. 26178, U. S. N. M., from station 895, in 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., at a depth of 238 fathoms; Cat. No. 31772, U. S. N. M., from station 1140, in 39° 34′ N. lat., 71° 56′ W. lon., at a depth of 374 fathoms; Cat. No. 28949, U. S. N. M., from station 1029, in 39° 57′ 06″ N. lat., 69° 16′ W. lon., at a depth of 458 fathoms; Cat. No. 28810, U. S. N. M., from station 945, in 39° 58′ N. lat., 71° 13′ W. lon., at a depth of 207 fathoms; Cat. No. 28735, U. S. N. M., from station 925, in 39° 55′ N. lat., 70° 47′ W. lon., at a depth of 229 fathoms; Cat. No. 28932, U. S. N. M., from station 1028, in 39° 57′ N. lat., 69° 17′ W. lon., at a depth of 410 fathoms; Cat. No. 28916, U. S. N. M., from station 1025, in 39° 49′ N. lat., 71° 25′ W. lon., at a depth of 216 fathoms; Cat. No. 28918, U. S. N. M., from station 998, in 39° 41′ N. lat., 71° 32′ W. lon., at a depth of 302 fathoms; Cat. No. 28161, U. S. N. M., from station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms; Cat. No. 26113, U. S. N. M., from station 869, in 40° 02′ 18″ N. lat., 70° 23′ 06″ W. lon., at a depth of 192 fathoms; and Cat. No. 26018, U. S. N. M., from station 870, in 40° 02′ 36″ N. lat., 70° 22′ 58″ W. lon., at a depth of 155 fathoms.

HIPPOGLOSSUS, Cuvier.

Hippoglossus, CUVIER, Règne Animal, ed. I, 1817, II, 221; ed II, 1829, 340.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 403.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 818.

Dextral pleuronectoids, having an oblong body, not strongly compressed. Mouth wide, oblique. Teeth in two series on the upper jaw, one on lower; the anterior ones above and the lateral teeth below, strong; vomer and palatines toothless; lower pharyngeal teeth in two rows. Dorsal origin above eye, its middle rays longest, its posterior rays, like those of anal, bifid; caudal crescentic; ventrals lateral. Scales small, cycloid; lateral line strongly curved in front. Gill rakers short, compressed, wide-set, and few in number. Vertebræ 16–34.

HIPPOGLOSSUS VULGARIS, FLEMING. (Fig. 363.)

Pleuronectes hippoglossus, LINNÆUS, Systema Naturæ, ed. X, I, 269.
Hippoglossus vulgaris, FLEMING, British Animals, 199.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 403.
Hippoglossus americanus, GILL, Proc. Acad. Nat. Sci. Phila., 1864, 220.

Body comparatively elongate, not strongly compressed, deep mesially, its height one-third of its length. Head broad, its length 3¾ in that of body. Eyes large, separated by a very broad, flattish area; lower eye in advance of upper. Mouth large, the maxillary reaching vertical from middle of orbit.

Radial formula: D. 105; A. 78.

Color, dark brown; blind side, white.

The halibut were once very abundant in Massachusetts Bay, but are now found chiefly at a depth of 100–300 fathoms on the slopes of the outer banks, where they are sought by a large fleet of Gloucester fishing schooners. Individuals are occasionally taken near the shore. In 1875 one weighing about 200 pounds was caught by a dory fisherman off Half-way Rock, Salem Harbor, and one still larger in Gloucester Harbor, in August, 1878.

The New London halibut smacks obtain many halibut on the south part of Georges Banks and the neighboring shoals. An individual was taken, years ago, on the outer side of Fishers Island, Connecticut. The halibut may, in all probability, be found to be abundant on the edge of the continental slope south of Cape Cod, since here have been recently obtained nearly all the species most constantly associated on the northern halibut grounds on the outer edges of La Have, Browns, Sable Island, and other banks off the coast of Nova Scotia and Newfoundland.

PLATYSOMATICHTHYS, Bleeker.

Reinhardtius, GILL, Cat. Fish. E. Coast N. Amer. 1861, 50 (name only).
Platysomatichthys, BLEEKER, Comptes Rendus, Acad. Sci. Amsterdam, VIII, 1862.

Dextral pleuronectoids, having the body somewhat elongate. Head and mouth large; maxillary reaching beyond vertical from anterior margin of eye. Jaws with strong, unequal teeth; the upper with two series in front, which converge posteriorly, the lower with a series of strong, distant teeth; vomer and palatines toothless. Gill rakers few in number, short and rough. Fins low, the caudal fin crescentic. Lower pharyngeal teeth in a single row. Scales small, cycloid, the lateral line straight. (*Jordan.*)

PLATYSOMATICHTHYS HIPPOGLOSSOIDES, (WALBAUM), GOODE and BEAN. (Figure 364.)

Pleuronectes cynoglossus, FABRICIUS, 1780 (not Gronovius).
Pleuronectes hippoglossoides, WALBAUM, Artedi, Pisc., 1792, 151.
Reinhardtius hippoglossoides, GILL, Cat. Fish. E. Coast N. Am., 1861, 50; Proc. Acad. Nat Sci. Phila., 1864, 218.
Platysomatichthys hippoglossoides, GOODE and BEAN, Cat. Fish. Essex Co., 1879, 7.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 819.—COLLETT, Norsk. Nordhavs. Exp. Fisk., 112.
Pleuronectes pinguis, FABRICIUS, K. Vid. Selsk. Nat. och Math. Afh., 1824, 43.
Hippoglossus pinguis, GAIMARD. Voy. Skand. et Lap. Poiss., pl. XXII.[1]
Platysomatichthys pinguis, BLEEKER, Versl. Medelel. K. Akad. Wetensch. Amsterdam, XIII, 1862, 426.
Hippoglossus pinguis, COLLETT, Norges Fiske, 1875, 135.—GÜNTHER, Challenger Report, XXII, 1887, 161.
Hippoglossus grœnlandicus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 404.

Body elongate, its height one-third of its length, that of the head one-fourth. Eyes parallel: the diameter of the orbit is one-eighth the length of the head, and one-half that of the snout; interorbital space flat, wider than the orbit. Lower jaw prominent, the length of the maxillary two-fifths of head. Teeth conical, pointed, in two series, convergent posteriorly on the upper jaw, those of the outer series decreasing in size; a pair of strong canines in the inner series in front, the others very small; a series of strong, distant teeth on lower jaw. Gill rakers short, thick, and strongly dentate. Fins naked. Dorsal and anal rays simple, the dorsal beginning over posterior third of the eye, its longest rays one-third length of head. Scales small, not ciliated.

Radial formula: D. 100; A. 75.

Color, brownish, or yellowish gray.

An Arctic species frequently brought in by the halibut fishing schooners of Gloucester. Its range extends as far south as the gully between Le Have and Browns Banks and Georges Banks. A young specimen, 165 mm. in length (D. 91; A. 72), was trawled by the *Albatross* at station 2431, in 43° N. lat., 57° 40′ 30″ W. lon., at a depth of 129 fathoms. The species also occurs in deep water off Norway, and a young one was taken by the Norwegian North Atlantic Expedition, southwest of Bear Island, in 447 fathoms. Unlike adult individuals, the young have the blind side colorless.

PARALICHTHYS, Girard.

Paralichthys, GIRARD, Pacific Railroad Survey Report, Fishes, 1858, 146.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 431.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 821.

Chænopsetta, GILL, Cat. Fish. E. Coast N. Amer., 1861, 50.

Pseudorhombus, BLEEKER, Compt. Rendus. Acad. Sci. Amsterdam, XIII, 1862, Pleuronectidæ, 5.—GÜNTHER, *op. cit.*, 423.

Xystreurys, JORDAN and GILBERT, Proc. U. S. Nat. Mus., 1880, 34.

Sinistral pleuronectoids, with body oblong; mouth large, oblique; each jaw with a single row of usually slender and sharp teeth, which are more or less enlarged anteriorly; no teeth on vomer or palatines. Gill rakers various. Scales small, ctenoid or cycloid; lateral line simple, with a strong curve anteriorly. Dorsal fin single, beginning above or before the eye; both ventrals lateral; caudal fin double truncate, or double concave, its middle rays produced. No anal spine. (*Jordan* and *Gilbert.*)

PARALICHTHYS OBLONGUS, (MITCHILL), JORDAN.

Pleuronectes oblonga, MITCHILL, Trans. Lit. and Phil. Soc. N. Y. I, 1814 (1815), 391.

Paralichthys oblongus, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 824—GOODE, Proc. U. S. Nat. Mus., III, 472.

Platessa quadrocellata, STORER, Proc. Bost. Soc. Nat. Hist., II, 1847, 242; Hist. Fish. Mass., 1867, 203, pl. XXXI, fig. 3.

Platessa quadrocularis, GILL, Cat. Fish. E. Coast N. A., 1861, 51.

Body much compressed, elongate, its greatest height less than two-fifths of its length. Head rather short, its length one fourth that of body. Eyes separated by a prominent, narrow, sharp ridge, the diameter of the orbit nearly one-fourth of the length of the head. Upper jaw with very numerous, small, close set teeth laterally, and 4 or 5 canines in front; the lateral teeth abruptly smaller than the anterior; lower jaw with 7 to 10 teeth on either side. Maxillary narrow, reaching past vertical from middle of pupil, its length two and one-fourth times in that of head. Scales weakly ctenoid or cycloid, over 90 in lateral line. Gill rakers thick and rather long, about 8 below angle. Dorsal low, beginning over front of eye, some of the anterior rays exserted, the longest rays behind middle of fin, their length not quite half that of head. No anal spine.

Radial formula: D. 72–86; A. 59–76.

Color, brownish gray, mottled; 4 large black ocellæ, each surrounded by a lighter margin; 2 behind middle of body, 1 below dorsal, and 1 above anal; 2 smaller spots near last rays of dorsal and anal.

This is a well marked species, known for many years as an inhabitant of moderate depths along the coast from Florida north to Massachusetts. The northern limit of its range is marked by the capture of a single small individual in 1877, off the mouth of Salem Harbor.

It is not properly a deep-sea species, but is included in the list on account of its occasional capture at the hundred fathom line.

The *Fish Hawk* obtained a single individual (Cat. No. 26078, U. S. N. M.) from station 873, in 40° 02′ N. lat., 70° 57′ W. lon., at a depth of 100 fathoms; and the *Albatross* took it from station 2307, in 35° 42′ N. lat., 74° 54′ 30″ W. lon., at a depth of 43 fathoms; from station 2313, in 32° 53′ N. lat., 77° 53′ W. lon., at a depth of 99 fathoms; from station 2421, in 37° 07′ N. lat., 74° 34′ 30″ W. lon., at a depth of 64 fathoms; Cat. No. 28861, U. S. N. M., from Buzzards Bay; and a single specimen from station 2297, in 35° 58′ N. lat., 74° 53′ W. lon., at a depth of 49 fathoms.

Günther enumerates other species of *Paralichthys* from deep waters, namely, *Paralichthys Hectoris*, (Günther,) from 150 fathoms, off New Zealand; *P. böops*, (Hector,) off Cape Farewell, 400 fathoms; and *P. ocellatus*, (Gthr.,) Admiralty Islands, 152 fathoms.

NOTOSEMA, Goode and Bean.

Notosema, GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 1883.

Sinistral pleuronectoids with elliptical body and pedunculate caudal fin. Mouth moderate in size, and beneath the central axis of the body. Eyes large upon left side, close together, the upper one nearly encroaching upon the profile, the lower slightly in advance of the upper. Teeth in single series in the jaws, about equally developed upon each side, much largest in front; absent on vomer and palatines. Pectoral fins somewhat unequal, that upon the blind side about three-fourths as large as its mate. The dorsal fin commences slightly behind the anterior margin of the upper eye, and the first eight rays are separated into a distinct subdivision of the fin, several of them being much prolonged.

Caudal fin pedunculate, rounded posteriorly. Sinistral ventral much elongated. Scales small, strongly ctenoid on colored side of body. Lateral line prominent, strongly arched over the pectoral, alike on both sides. Gill rakers moderately numerous, rather stout, subtriangular, pectinate posteriorly. Pseudobranchiæ well developed. Vertebræ 35.

NOTOSEMA DILECTA, GOODE and BEAN. (Figures 365 A, B, 362, young.)

Notosema dilecta, GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 193.
Ancylopsetta dilecta, JORDAN, Cat. Fish. N. America, 1885, 131.

The height of the body is contained twice in its total length, without caudal, and is equal to twice the distance of the origin of the ventral from the snout. The height of the caudal peduncle is one-ninth of the standard body length.

The length of the head is two-sevenths of the standard length, and three times the diameter of the eye. Width of interorbital area almost imperceptible. Mandible reaching to middle of pupil of lower eye, its length equal to half that of the head. Upper jaw contained 2½ times in length of head.

The dorsal fin, beginning almost over the anterior margin of the eye, is composed of about 68 rays, the longest of which are the second and third, which are contained twice in the greatest height of the body, and which are almost twice as long as the length of the base of the triangular division of the fin to which they belong.

The anal fin is made up of 54–56 simple rays, of which the posterior ones are largest, as they are also in the main portion of the dorsal. It begins close to the vent, at a distance from the snout equal to the length of the elongated sinistral ventral.

The caudal is pedunculate, its middle rays somewhat elongate, giving it a wedge shaped outline.

The pectoral of the colored side is subtriangular, its length contained five and one-half times in the standard length.

The ventrals are composed of six rays, that upon the colored side much produced in its anterior portion, its length more than three times that of its mate.

Radial formula: D. 69; A. 56; P. 11; V. 6; B. 7. Lateral line 48 (in straight portion).

Color on the left side purplish brown, speckled with dark brown, and with three large ocellated subcircular spots, nearly as large as the eye, with white center, dark iris, narrow light margin, and a brown encircling outline. They are arranged in the form of an isosceles triangle, the spot marking the apex being upon the lateral line, near the base of the caudal peduncle, the others distant from the lateral line, on either side, a space equal to their own diameters, the lower one nearly reached by the tip of the elongate ventral. On the blind side white. Fins blotched with dark brown.

The *Blake* obtained 4 specimens from station CCCXIII, off Charleston, S. C., in 32° 31′ 50″ N. lat., 78° 45′ W. lon., at a depth of 75 fathoms, and a single individual from station CLXVIII, in 23° 13′ N. lat., 89° 10′ W. lon., at a depth of 84 fathoms. Examples were also secured by the *Albatross* from station 2311, in 32° 55′ N. lat., 77° 54′ W. lon., at a depth of 79 fathoms; from station 2313, in 32° 53′ N. lat., 77° 53′ W. lon., at a depth of 99 fathoms; from station 2378, in 29° 14′ 30″ N. lat., 88° 09′ 30″ W. lon., at a depth of 68 fathoms; from station 2403, in 28° 42′ 30″ N. lat., 85° 29′ W. lon., at a depth of 88 fathoms; and from station 2312, in 32° 54′ N. lat., 77° 53′ 30″ W. lon., at a depth of 88 fathoms.

HIPPOGLOSSOIDES, Gottsche.

Hippoglossoides, GOTTSCHE, Wiegmann's Archiv., 1835, 168.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 405.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., IV, 405.

Psettichthys, GIRARD, Proc. Acad. Nat. Sci., Phila., 1854, 140.

Pomatopsetta, GILL, Proc. Acad. Nat. Sci., Phila., 1864, 217.

Dextral[1] pleuronectoids having the body oblong and somewhat compressed; mouth rather large, having a single row of sharp teeth on each jaw, and sometimes an inner row of small ones in the upper jaw; vomer and palatines toothless; gill rakers long and slender. Scales ctenoid; lateral line nearly straight, simple, or with accessory branch. Dorsal fin low in front, beginning over or before the eye. Ventrals both lateral. Caudal double truncate, produced.

HIPPOGLOSSOIDES PLATESSOIDES, (FABRICIUS), GILL. (Figure 367.)

Pleuronectes platessoides, FABRICIUS, Fauna Grœnlandica, 1780, 164 (excellent description).—"Vidensk. Selsk. Naturv. och Mathem. Afhandl., I, 50, pl. II, fig. 2."

Citharus platessoides, REINHARDT, *ibid.* VII, 1838, p. 130.—KRÖYER, in Gaimard, Voyage en Scandinavie, etc. pls. XXI (excellent figure).

Drepano (p) setta platessoides, GILL, Cat. Fish. E. Coast N. America, 1861, 50.

Hippoglossoides platessoides, GILL, Proc. Acad. Nat. Sci. Phila., 1864, 217.—GOODE and BEAN, Cat. Fish. Essex Co., Mass., 1879, 7.—COLLETT, Norsk. Nordh. Exp. Fiske, 1875, 145.—GOODE, Proc. U. S. Nat. Mus., III, 471.—GÜNTHER, Challenger Report, XXII, 1887, 161.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 826.

Platessa dentata (not *Pleuronectes dentatus*, Mitchill), STORER, Rep. Fish. Mass. 1839, p. 143; Hist. Fish. Mass. 1867, 197, pl. XXX, fig. 3.

Hippoglossoides dentatus, GILL, Cat. Fish. E. Coast N. A., 1861, 50.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862. 406.

Pomatopsetta dentata, GILL, Proc. Acad. Nat. Sci. 1864, 217 (with def. of *Pomatopsetta*, 216).

Hippoglossoides limandoides, GOODE and BEAN, Amer. Journ. Sci. and Arts, XVII, 1876, 39.

Body moderately elongate, its height two-fifths of its length. Head short, its length $3\frac{3}{4}$ in that of body. Mouth moderate, oblique; maxillary narrow, reaching to vertical from middle of orbit, its length $2\frac{2}{3}$ times in that of head. Teeth moderate, conical; in one row in each jaw, those in the lower jaw largest. Eyes moderate, the upper one largest and longer than snout. Lower jaw included. Lateral line nearly straight, simple, containing about 90 pierced scales. Interorbital space narrow, with a raised, obtuse ridge, entirely covered with rough scales; mandible scaly. Gill rakers short and robust, smooth, about 10 below angle; the length of the longest less than one-third diameter of orbit. Fins covered with small, rough scales. A strong pre-anal spine. Pectoral not quite half as long as the head.

Radial formula: D. 80–93; A. 64–75.

Color, ferruginous.

This species is not unusual in deep water off southern Massachusetts and Rhode Island, approaching the coasts in winter. South of Spitzbergen and Bear Island it occurs at depths of 120–220 fathoms. The *Albatross* took it from station 2453, in 47° 10′ N. lat., 51° 02′ W. lon., at a depth of 82 fathoms; from station 2499, in 44° 46′ 30″ N. lat., 59° 55′ 45″ W. lon., at a depth of 130 fathoms; from station 2430, in 42° 58′ 30″ N. lat., 50° 50′ W. lon., at a depth of 179 fathoms; from station 2498, in 44° 54′ N. lat., 59° 46′ 45″ W. lon., at a depth of 65 fathoms; from station 2431, in 43° N. lat., 50° 47′ 30″ W. lon., at a depth of 129 fathoms; from station 2452, in 47° 04′ N. lat., 50° 48′ W. lon., at a depth of 89 fathoms; from station 2461, in 45° 47′ N. lat., 54° 13′ 30″ W. lon., at a depth of 59 fathoms; from station 2455, in 47° 21′ N. lat., 51° 38′ 30″ W. lon., at a depth of 81 fathoms; from station

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[1] In *H. elassodon* reversed individuals sometimes are found.

2435, in 43° 12′ N. lat., 50° 38′ 45″ W. lon., at a depth of 47 fathoms; from station 2457, in 47° 13′ N. lat., 52° 24′ W. lon., at a depth of 86 fathoms; Cat. No. 33424, U. S. N. M., from station 2080, in 41° 13′ N. lat., 66° 21′ 50″ W. lon., at a depth of 55 fathoms; from station 2437, in 43° 36′ N. lat., 50° 05′ W. lon., at a depth of 37 fathoms; from station 2505, in 44° 23′ 30″ N. lat., 61° 44′ 15″ W. lon., at a depth of 93 fathoms; Cat. No. 33423, U. S. N. M., from station 2079, in 41° 13′ N. lat., 66° 21′ 50″ W. lon., at a depth of 55 fathoms; and Cat. No. 33408, U. S. N. M., from station 2057, in 42° 01′ N. lat., 68° 00′ 30″ W. lon., at a depth of 86 fathoms. The *Fish Hawk* obtained the following specimens: Cat. No. 28911, U. S. N. M., from station 992, in 40° 33′ N. lat., 70° 45′ W. lon., at a depth of 36 fathoms; Cat. No. 28979, U. S. N. M., from station 1038, in 39° 48′ N. lat., 70° 06′ W. lon., at a depth of 146 fathoms; Cat. No. 28726, U. S. N. M., from station 917, in 40° 22′ N. lat., 70° 42′ W. lon., at a depth of 44 fathoms; Cat. No. 28744 U. S. N. M., from station 918, in 40° 20′ 24″ N. lat., 70° 41′ 30″ W. lon., at a depth of 46 fathoms; and from station 989, in 40° 49′ N. lat., 70° 47′ W. lon., at a depth of 30 fathoms. The National Museum possesses an additional specimen (Gloucester Donation No. 234).

LEPIDORHOMBUS, Günther.

Lepidorhombus, (subg. of *Rhombus*), GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 407, 411.

Sinistral pleuronectoids with mouth wide, the length of the maxillary being more than one-third of that of the head. Each jaw with a narrow band of villiform teeth, without canines; vomerine teeth; none on the palatines. The dorsal fin commences on the snout; nearly all the dorsal and the anal rays branched. Ventral free from anal; scales small and ciliated. Gill membranes scarcely united at the throat; gill rakers well developed, lanceolate. Branchiostegals 7. (*Günther.*)

LEPIDORHOMBUS MEGASTOMA, (DONOVAN), GÜNTHER.

Pleuronectes megastoma, DONOVAN, British Fishes, III, 51.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 188.
Rhombus (*Lepidorhombus*) *megastoma*, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 411.

The height of the body is contained 2⅜ in the total length (without caudal), the length of the head 3½. Scales rather small, with the posterior margin ciliated and rounded, covering nearly the whole head (the interorbital space and the maxillary included); interorbital space very narrow; the diameter of the eye is two ninths the length of the head. Each fin ray is accompanied by a series of minute rough scales. Lateral line with a sub-semicircular curve above the pectoral. Lower jaw prominent; the length of the maxillary is contained 2⅓ in that of the head. Teeth in the jaws in a very narrow band, widening anteriorly. The lower eye is somewhat in advance of the upper. The dorsal fin terminates at a distance from the caudal which equals the depth of the free portion of the tail; its longest rays are at the commencement of the posterior third of the fin, where they are two-fifths of the length of the head, and somewhat shorter than the pectoral. No spine before the anal.

Radial formula: B. 7; D. 85—87; A. 67—69; L. lat. 120. Vert. 11-30.

Color, yellowish brown. (*Günther.*)

This form, occasionally found on the coasts of Great Britain and Scandinavia, was taken by the French deep-sea explorers at various points off the coasts of Spain and Morocco and the Azores, at depths of 60 to 560 meters (stations XVII (1880); VIII (1882); II; IV; V; VI; XVII; CXXIII). Out of 29 specimens, 24 were from inside the 100-fathom line—those from the Azores (560 meters) and off Morocco (550 meters) the deepest.

SCIANECTES, Alcock. (Figure 371.)

Scianectes, ALCOCK, Journal Asiatic Society of Bengal, LVIII (II), 1889, 284; Ann. and Mag. Nat. Hist., 1890 (Nov.), 398, 1890 (II), 216; Bathybial Fishes, Bay of Bengal, 27.

Cleft of mouth narrow, the maxillary less than a third the length of the head, dentition more developed on blind side. Dorsal fin commencing before the eye, on the snout. Body pyriform and delicate. Vomerine teeth. Eyes on the left side and close together. All the rays of the vertical fins simple, elongated, weak, and filamentous. Scales minute, membranous, and very deciduous. Lateral line with a curve above the pectoral. Gill membranes united at the throat. Gill rakers distant and short.

Represented by two species, *S. lophoptera*, Alcock, mouth of Devi River, 68 fathoms (*loc. cit.*), and *S. macropththalmus*, Alcock, from Bay of Bengal, 40 miles south-west of Akyab, in about 100 fathoms of water (*loc. cit.*, Ann. and Mag. Nat. Hist., 1890, II, 216), and from station, 96, 98–102 fathoms.

TRICHOPSETTA, Gill.

Trichopsetta, GILL, PROC. U. S. Nat. Mus., 1888, 603.

Psettines with the body oblong, rhombo-oval, covered with adherent ctenoid scales; lateral line with an arch differentiated in front on eyed side, obscure but rectilinear on blind side; profile incurved or rectilinear; mouth large; supramaxillary bones obliquely truncated behind; teeth small, somewhat enlarged and hooked in front, uniserial; dorsal and anal symmetrical behind, dorsal commencing on snout and deflected towards right nostril; caudal subsessile and convex; pectorals very unequal, the left obtuse, the right with the second and third rays extended and filiform; ventrals both free, very unequal; the left fin on the abdominal ridge with a moderately broad base and 6 rays, the last of which is attached by membrane to the ridge; the right fin with a narrower base (and in the males with the inner 4 rays setiform, but in the female nearly similar to the left fin); interbranchial membrane imperforate; gill rakers slender and unarmed.

TRICHOPSETTA VENTRALIS, (GOODE and BEAN), GILL. (Figure 372.)

Citharichthys ventralis, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 592.
Trichopsetta ventralis, GILL, *loc. cit.*

Extreme length of specimen described, 117 millimeters. No. 37343, Gulf of Mexico, *Albatross* station 2386, 60 fathoms.

The height of the body (50 millimeters) is about 2⅛ times in its total length (without caudal), and is equal to about 4½ times the height of the tail (11) and about 9 times its thickness (5½).

The scales are ovate, strongly ctenoid, the largest about 3 millimeters in diameter; the diameter less than half that of the eye. The scales are firmly fixed; there are 66 scales in the lateral line (on the colored side), 19–21 of these in the curved portion, which is bold and sharply defined; and 19 above and 23 below the lateral line at broadest part of body.

The length of the head (29 millimeters) is one-fourth that of the body, and 3⅝ times the diameter of the eye (8); the interorbital space is very narrow, scaleless, its width equal to one-eighth diameter of eye. The length of mandible (16 millimeters) is twice the diameter of the eye; the length of maxillary (13 millimeters) less than half that of head.

The dorsal fin begins upon the snout, upon the blind side, and in advance of the eyes; its greatest height about equal to length of mandible. It is composed of 93 simple rays. The anal begins under the axil of the pectoral, its longest ray (equal to longest in dorsal) equals or slightly exceeds half the distance of its anterior ray from the snout. It is composed of 73 simple rays.

The caudal is subsessile, composed of 17 rays, its length (24 millimeters) a little less than half the height of body, and equal to length of head without snout.

The pectorals are inserted considerably below the origin of the lateral line, close to the gill opening. That on the colored side is composed of 11 rays, its length (19 millimeters) nearly one-sixth of the total length; that of the blind side composed of 7 or 8 rays, the largest (28 millimeters), almost as long as head.

Radial formula: D. 93; A. 73; P. 11, 7 or 8; V. 6; L. lat. 66.

Color, light brownish gray, a dark blotch as long as the eye on the anterior rays of the anal; a few obscure ones on different parts of lighter hue at the junction of the curved and straight portions of the lateral line.

PLATOPHRYS, Swainson.

Platophrys, SWAINSON., Nat. Hist. Fishes, etc., 1839, II, 302.

Rhomboidichthys, BLEEKER, Act. Soc. Sc. Indo-Nederl. Manad. and Makass., 67.—GÜNTHER, Cat. Fish Brit. Mus., IV, 431.

Mouth of moderate width, or small, the length of the maxillary being one third, or less than one-third, of that of the head. Teeth minute, of equal size, in a single or double series; vomerine and palatine teeth none. Eyes separated by a concave more or less broad space. The dorsal commences on the snout; dorsal and anal rays simple. Scales ciliated, of moderate size (L. lat. 40) and deciduous; lateral line with a strong curve anteriorly. Eyes on the left side. (*Günther*.)

PLATOPHRYS NEBULARIS, JORDAN and GILBERT.

Platophrys nebularis, JORDAN and GILBERT, Proc. U. S. Nat. Mus., VII, 31, June 3, 1881.

Body ovate, deep anteriorly, the profile descending steeply, rendered abruptly concave in front of interorbital space by the conspicuously projecting, short snout. Mouth very small and oblique, the maxillary reaching vertical from front of lower eye, $3\frac{2}{3}$ in head; tip of lower jaw entering the profile. Teeth fine, conical, in two series in the upper jaw, one in the lower; those of the outer row in upper jaw larger and more widely separated than those of the inner series.

Snout very short. about one-fifth head, equaling interorbital width. Interorbital space narrow, deeply concave, closely scaled. Eyes large, the lower in advance of upper, its diameter $3\frac{3}{8}$ in head. Gill rakers obsolete, 7 rudiments on horizontal branch of anterior arch.

Scales moderate, not extending on the fins, those on colored side ctenoid, those on blind side smooth. Arch of lateral line short and high, its base contained $4\frac{1}{2}$ to 5 times in the straight portion.

Dorsal beginning opposite anterior nostril, the rays nearly uniform in length, the longest about half head. Pectoral of colored side $1\frac{2}{3}$ in length. Ventral of colored side beginning under middle of lower eye, with 6 rays; the right ventral with 5 rays.

Head 4 in length; depth $1\frac{1}{2}$.

Radial formula: D. 85; A. 64; L. lat. 75 (pores).

Color, in life, light grayish with reddish tinge, covered with small round spots of darker gray and with lighter rings inclosing spaces of the ground color. Vertical fins similarly colored, with a small black spot near base of each ninth or tenth ray. Two black spots on median line of body divide the length into nearly equal thirds; some other small black spots scattered over colored side. (*Jordan* and *Gilbert*.)

The specimens before us agree in all particulars with Jordan and Gilbert's description, save in trifling variations in number of fin rays and in the fact that in large specimens the ciliations of the scales are absent. In three specimens of medium size, the first ray of the pectoral of the colored side is elongated, in one considerably so.

Specimens were taken by the *Blake* from station CCXLIII, in 24° 43′ N. lat., 83° 25′ W. lon., at a depth of 37 fathoms; also by the *Albatross* from station 2318, in 24° 25′ 48″ N. lat., 81° 46′ W. lon., at a depth of 45 fathoms; from station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms; from station 2406, in 28° 46′ N. lat., 84° 49′ W. lon., at a depth of 26 fathoms; from station 2414, in 25° 04′ 30″ N. lat., 82° 59′ 15″ W. lon., at a depth of 26 fathoms; from station 2407, in 28° 47′ 30″ N. lat., 84° 37′ W. lon., at a depth of 24 fathoms.

A closely related species, *P. cornutus*, was obtained by the *Challenger* from stations 122 and 122 B, off the coast of Brazil, at depths between 32 and 350 fathoms. (Günther, Challenger Report VI, 7, pl. II, fig. B; XXII, 165.)

CITHARICHTHYS, Bleeker.

Citharichthys, BLEEKER, in GÜNTHER, Cat. Fish. Brit. Mus., IV, 420, 1862; and in Compt. Rend. Acad. Sci. Amsterdam, XIII, 1862 (type, *Citharichthys cayennensis*, BLEEKER.)—GOODE, Proc. U. S. Nat. Mus., III, 1880, 340.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 816 (part).

Sinistral pleuronectoids with ovate body. Mouth large, the maxillary nearly half as long as the head. Eyes sinistral, large, the uppermost not close to dorsal outline. Teeth feeble, in single series, nearly equally developed on each side. Pectoral upon blind side fewer-rayed, much longer than its counterpart. Ventrals asymmetrically placed, the sinistral one upon the median ventral line, that upon the blind side produced in the males. Dorsal fin commencing in advance of the eyes upon the snout, and upon the blind side of the dorsal line. Dorsal and anal rays simple.

Scales moderate, ovate, strongly pectinate, firmly attached. Lateral line of colored side strongly arched over pectoral as in *Limanda*. Gill rakers short, rather stout, flexible. Vertebræ 34 (in *C. arctifrons*). Gill membranes broadly united below the throat; gill rakers lanceolate. Branchiostegals 5.

CITHARICHTHYS ARCTIFRONS, GOODE. (Figures 366, A, B.)

Citharichthys arctifrons, GOODE, Proc. U. S. Nat. Mus., III, 1880, 341, 472.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 194.—GÜNTHER, Challenger Report, XXII, 1887, 165.

The height of the body (37) is about three-eighths of its total length (without caudal), and is equal to about 4 times the height of the tail (9) and about 5 times its thickness (7).

The scales are irregularly polygonal, cycloid; the largest about 6 millimeters in diameter; the diameter (5) nearly equal to that of the eye. The scales are flexible, loosely arranged, and very easily detached, so that it is difficult to secure a specimen in good order. Small scales on the rays of the ventral fins. There are 40 scales in the lateral line (on the colored side), which is sharply defined and straight, and 7 or 8 above and the same number below the lateral line at the broadest part of the body.

The length of the head (24–24½) is about one-fourth that of the body, and 4 times the diameter of the eye (6). The interorbital space (1) is very narrow, equal to the difference in the distances from snout to lower eye (4) and snout to upper eye (5). The length of mandible (10–10½) is about double the latter distance; the length of the maxillary (7–7½) slightly more than the greatest width of the body.

The dorsal fin begins upon the snout, above the anterior margin of the upper eye. Its greatest height (13–15) is about three times the distance of its anterior ray from the snout. It is composed of 82 to 83 simple rays. The anal begins under the axil of the pectoral, its greatest height (14–15) equal to or slightly exceeding half the distance of its anterior ray from the snout. It is composed of 67 simple rays.

The caudal is subsessile, triangular, of 16 rays; its length about equal to that of the head. In dorsal, anal, and caudal the rays appear to project beyond the connecting membrane half or two-thirds of their own length.

The pectorals are inserted far below the lateral line and close to the gill opening. The pectoral on the colored side is composed of more rays (9–10) than that of the blind side (7), its length (17–19) being about double that of its mate (7–9). The ventrals are composed of 4 rays.

Color dirty light brown.

Radial formula: D. 82–83; A. 67; C. 16; P. 9–10, 7; V. 5; L. lat. 40.

Current number of specimen	25,908.			
Locality	871.		871.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length	137		122	
Length to end of middle caudal rays	111	100	102	100
Body:				
Greatest height of middle dorsal		38 5		37
Greatest width		7		
Least height of tail		9		9
Head:				
Greatest length		24 25		24
Width of interorbital area		1		1
Length of snout to upper eye		5		5
Length of maxillary		7 25		7
Length of mandible		10 25		10
Distance from snout to lower eye		4		4
Diameter of orbit, longitudinal		6		6
Dorsal (spinous):				
Distance from snout		4 75		5
Length of base		90		
Greatest height, posterior ½		15		13
Anal:				
Distance from snout		28 75		27
Length of base		71		
Height at longest ray, posterior ⅓		14		15
Caudal: Length of middle rays		25 50		23
Pectoral:				
Distance from snout		25		25
Length		19 7		17 9
Ventral:				
Distance from snout		22		21
Length		11		10
Dorsal		83		82
Anal		67		67
Caudal		16		
Pectoral		10 7		9 7
Ventral		5		5
Number of scales in lateral line, from root of ventral obliquely back		40		40
Number of transverse rows above lateral line				1

The type (Cat. No. 25908, U. S. N. M.) and another specimen (Cat. No. 26130, U. S. N. M.) were taken by the *Fish Hawk* from station 871, in 40° 02′ 54″ N. lat., 70° 23′ 40″ W. lon., at a depth of 115 fathoms. Examples were also obtained by the same vessel from station 897, in 37° 25′ N. lat., 74° 18′ W. lon., at a depth of 157½ fathoms; from station 941, in 40° 01′ N. lat., 69° 56′ W. lon., at a depth of 79 fathoms; from station 923, in 40° 01′ 24″ N. lat., 70° 46′ W. lon., at a depth of 98 fathoms; from station 922, in 40° 03′ 48″ N. lat., 70° 45′ 54″ W. lon., at a depth of 51 fathoms; Cat. No. 28729, U. S. N. M., from station 920, in 40° 13′ N. lat., 70° 41′ 54″ W. lon., at a depth of 63 fathoms; Cat. No. 33349, U. S. N. M., from station 1156, in 40° 13′ N. lat., 70° 29′ W. lon., at a depth of 60 fathoms; Cat. No. 26744, U. S. N. M., from station 896, in 37° 26′ N. lat., 74° 19′ W. lon., at a depth of 56 fathoms; Cat. No. 26721, U. S. N. M., from station 901, in 37° 10′ N. lat., 75° 08′ W. lon., at a depth of 18 fathoms; Cat. No. 28977, U. S. N. M., from station 1038, in 39° 58′ N. lat., 70° 06′ W. lon., at a depth of 146 fathoms; Cat. No. 28731, U. S. N. M., from station 921, in 40° 07′ 48″ N. lat., 70° 43′ 54″ W. lon., at a depth of 67 fathoms; Cat. No. 28779, U. S. N. M., from station 941, in 40° 01′ N. lat., 69° 56′ W. lon., at a depth of 79 fathoms; Cat. No. 33358, U. S. N. M., from station 1158, in 40° 16′ N. lat., 70° 31′ W. lon., at a depth of 62 fathoms; Cat. No. 31872, U. S. N. M., from station 1151, in 39° 58′ 30″ N. lat., 70° 37′ W. lon., at a depth of 125 fathoms; Cat. No. 28724, U. S. N. M., from station 919, in 40° 16′ 18″ N. lat., 70° 41′ 18″ W. lon., at a depth of 53 fathoms; Cat. No. 28776, U. S. N. M., from station 940, in 39° 54′ N. lat., 69° 51′ 30″ W. lon., at a depth of 134 fathoms; Cat. No. 28939, U. S. N. M., from station 1035, in 39° 57′ N. lat., 69° 28′ W. lon., at a depth of 120 fathoms; Cat. No. 28971, U. S. N. M., from station 1039, in 39° 59′ N. lat., 70° 06′ W. lon., at a depth of 130 fathoms; Cat. No. 29064, U. S. N. M., from station 1047, in 38° 31′ N. lat., 73° 21′ W. lon., at a depth of 156 fathoms; Cat. No. 26722, U. S. N. M., from station 899, in 37° 22′ N. lat., 74° 29′ W. lon., at a depth of 57½ fathoms; Cat. No. 28741, U. S. N. M., from station 923, in 40° 01′ 24″ N. lat., 70° 46′ W. lon., at a depth of 98 fathoms; Cat. No. 28846, U. S. N. M., from station 950, in 40° 07′ N. lat., 70° 32′ W. lon., at a depth of 71 fathoms; Cat. No. 26129, U. S. N. M., from station 870, in 40° 02′ 36″ N. lat., 70° 22′ 58″ W. lon., at a depth of 155 fathoms; Cat. Nos. 26100, 26101, 26117, and 26119, U. S. N. M., from station 876, in 39° 57′ N. lat., 70° 56′ W. lon., at a depth of 120 fathoms; Cat. Nos. 26118 and 26124,

U. S. N. M., from station 878, in 39° 55′ N. lat., 70° 54′ 15″ W. lon., at a depth of 142¼ fathoms; Cat. No. 26127, U. S. N. M., from station 873, in 40° 02′ N. lat., 70° 57′ W. lon., at a depth of 100 fathoms, and Cat. No. 26121, U. S. N. M., from station 877, in 39° 56′ N. lat. 70° 54′ 18″ W. lon., at a depth of 126 fathoms. Numerous specimens taken by the *Fish Hawk* on September 4, 1880, ranged in length from 90 to 140 meters The females were full of ripe spawn. It is not probable, therefore, that the average size of the species is much greater than that of the specimens described.

The *Blake* secured examples as follows: Eight young individuals, the longest measuring 2 inches, from station CCCXIII, off Charleston, S. C., in 75 fathoms; 3 specimens, badly mutilated, from station CCCXXXVI, in 38° 21′ N. lat., 73° 32′ W. lon., at a depth of 197 fathoms; a large one from station CCCXI, in 39° 59′ 30″ N. lat., 70° 12′ W. lon., at a depth of 143 fathoms; and others from station CCCXIV, in 32° 24′ N. lat.. 78° 44′ W. lon., at a depth of 142 fathoms, and from station CCCXXXV, in 38° 22′ 05″ N. lat., 73° 33′ 40″ W. lon., at a depth of 89 fathoms. The peculiar elongated snout, similar to that of *Macrurus*, is characteristic of the larger individuals.

The *Albatross* took it from station 200, 4in 37° 19′ 45″ N. lat., 74° 24′ 06″ W. lon., at a depth of 102 fathoms; from station 2421, in 37° 07′ N. lat., 74° 34′ 30″ W. lon., at a depth of 64 fathoms; Cat. No. 2261, in 40° 04′ N. lat., 69° 29′ 30″ W. lon., at a depth of 58 fathoms; Cat. No. 33500, U. S. N. M., from station 2087, in 40° 06′ 50″ N. lat., 70° 34′ 15″ W. lon., at a depth of 65 fathoms; from station 2264, in 37° 07′ 50″ N. lat., 74° 34′ 20″ W. lon., at a depth of 167 fathoms; from station 2309, in 35° 43′ 30″ N. lat., 74° 52′ W. lon., at a depth of 56 fathoms; from station 2420, in 37° 03′ 20″ N. lat., 74° 31′ 40″ W. lon., at a depth of 104 fathoms; from station 2177, in 39° 33′ 40″ N. lat., 72° 08′ 45″ W. lon., at a depth of 87 fathoms; from station 2021, in 37° 36′ N. lat., 74° 15′ W. lon., at a depth of 179 fathoms; from station 2243, in 40° 10′ 15″ N. lat., 70° 26′ W. lon., at a depth of 63 fathoms; from station 2425, in 36° 20′ 24″ N. lat., 74° 46′ 30″ W. lon., at a depth of 119 fathoms; from station 2031, in 39° 29′ N. lat., 72° 19′ 40″ W. lon., at a depth of 74 fathoms; from station 2032, in 39° 29′ N. lat., 72° 19′ 55″ W. lon., at a depth of 74 fathoms; from station 2298, in 35° 39′ N. lat., 74° 52′ W. lon., at a depth of 80 fathoms; from station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms; from station 2420, in 37° 03′ 20″ N. lat., 74° 31′ 40″ W. lon., at a depth of 104 fathoms; from station 2423, in 37° 10′ 15″ N. lat., 74° 32′ W. lon., at a depth of 103 fathoms; from station 2559, in 39° 48′ N. lat., 71° 48′ 30″ W. lon., at a depth of 120 fathoms; from station 2542, in 40° 00′ 15″ N. lat., 70° 42′ 20″ W. lon., at a depth 129 fathoms; from station 2560, in 39° 48′ 10″ N. lat., 71° 48′ 40″ W. lon., at a depth of 114 fathoms; Cat. No. 35675, U. S. N. M., from station 2249, in 40° 11′ N. lat., 69° 52′ W. lon., at a depth of 53 fathoms; Cat. No. 35678, U. S. N. M., from station 2248, in 40° 05′ 15″ N. lat., 70° 23′ W. lon., at a depth of 67 fathoms; Cat. No. 35679, U. S. N. M., from station 2241, in 40° 21′ N. lat. 70° 29′ 15″ W. lon., at a depth of 50 fathoms; Cat. No. 35676, U. S. N. M., from station 2248, in 40° 07′ N. lat., 69° 57′ W. lon., at a depth of 67 fathoms; Cat. No. 35677, U. S. N. M., from station 2242, in 40° 15′ 30″ N. lat., 70° 27′ W. lon., at a depth of 58 fathoms; Cat. No. 32809, U. S. N. M., from station 2014, in 36° 41′ 05″ N. lat., 74° 38′ 55″ W. lon., at a depth of 373 fathoms; Cat. No. 32652, U. S. N. M., from station 2004, in 37° 19′ 45″ N. lat., 74° 26′ 06″ W. lon., at a depth of 102 fathoms; Cat. No. 35674, U. S. N. M., from station 2247, in 40° 03′ N. lat., 69° 57′ W. lon., at a depth of 78 fathoms; Cat. No. 35474, U. S. N. M., from station 2199, in 39° 57′ 30″ N. lat., 69° 41′ 10″ W. lon., at a depth of 78 fathoms; Cat. No. 33541, U. S. N. M., from station 2086, in 40° 05′ 05″ N. lat., 70° 35′ W. lon., at a depth of 69 fathoms; and Cat No. 32818, U. S. N. M.. from station 2016, in 37° 31′ N. lat., 74° 52′ 36″ W. lon., at a depth of 19 fathoms.

CITHARICHTHYS UNICORNIS, Goode. (Figure 369, A, B.)

Citharichthys unicornis, Goode, Proc. U. S. Nat. Mus., III, 1880, 342; *ibid*, 472.—Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 818.—Günther, Challenger Report, XXII, 1887, 166.

The greatest height of the body (47) is slightly less than its length, and is about 4¼ times its least height at the tail (11). The body is much higher than in *C. arctifrons*, its greatest height over the pectorals, the contours then descending in almost straight lines to the base of the tail. The thickness of the body (6) is less than in *C. arctifrons*, being contained nearly 17 times in the standard length.

The scales are thin, deciduous, smaller than in *C. arctifrons*. There are about 40 scales in the lateral line, which is slightly curved over the pectoral, and, as nearly as can be determined in the denuded specimens before me, about 12 rows above and 12 below the lateral line at the broadest part of the body.

The length of the head (25) is one-fourth of the standard length and about 3 times the diameter of the eye (9), or the distance from the snout to the upper eye (9). The interorbital space is wide (4), equal to the length of the snout, and diagonally crossed by a strong ridge, a continuation of two ridges which form the upper boundary of the lower and the lower boundary of the upper orbit.

The length of the maxillary (11) is less than half, that of the mandible (13) more than half, that of the head. The teeth are minute, in single rows, closely set in the jaws, somewhat stronger upon the blind side. A strong short spine above the snout, at the anterior termination of the ridge at the lower margin of the upper eye. Hence the specific name, *unicornis*.

The dorsal fin begins at the side of the preorbital spine, its anterior rays being slightly crowded over upon the blind side. It is composed of 73 to 75 simple rays. Its greatest height (13) is half the length of the head.

The distance of the anal from the snout (33) is one-third of the standard length. The number of rays is 60; their longest (13) equal in length to the longest dorsal rays.

The caudal is pointed, triangular, subsessile; its length (22) twice that of the maxillary (11) and two-thirds the distance from the snout to the anal (33). The pectorals are inserted far below the lateral line. The pectoral of the colored side is twice as long (18) as the diameter of the eye, that of the blind side as long (13) as the longest dorsal rays. The former is composed of 10 rays, the latter of 4.

The length of the ventrals (11) is half that of the caudal. They are asymmetrically placed, as is described under the generic diagnosis.

Radial formula: D. 73–75; A. 60; P. 4, right, 10, left; L. lat. 40.

Color, ashy gray, with dark lateral line. Eyes black.

Current number of specimens	26,003	
Locality	870 and 871	
	Millimeters.	100ths of length
Extreme length	69	
Length to origin of middle caudal rays	57	100
Body:		
Greatest height		47
Least height of tail		11
Head:		
Greatest length		25
Distance from snout to upper eye		9
Distance from snout to lower eye		5
Width of interorbital area		4
Length of snout		4
Length of maxillary		11
Length of mandible		13
Diameter of orbit, longitudinal		9
Dorsal (spinous):		
Distance from snout		5
Greatest height		13
Anal:		
Distance from snout		33
Height at longest ray		13
Caudal: Length of middle rays		22
Pectoral:		
Distance from snout		28
Length		18–13
Ventral:		
Distance from snout on colored side		26
Length		11
Dorsal		75 73
Anal		60
Pectoral		4 R., 10 L.
Number of scales in lateral line		40

The type specimen (Cat. No. 26003, U. S. N. M.), 69 millimeters in length, was taken by the *Fish Hawk* from station 870, in 40° 02′ 36″ N. lat., 70° 22′ 58′ W. lon., at a depth of 155 fathoms, and from station 871, in 40° 02′ 54″ N. lat., 70° 23′ 40″ W. lon., at a depth of 115 fathoms. The *Albatross* obtained examples from station 2318, in 24° 25′ 45″ N. lat. 81° 46′ W. lon., at a depth of 45 fathoms; from station 2401, in 28° 38′ 30″ N. lat., 85° 52′ 30″ W. long., at a depth of 142 fathoms; from station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms; from station 2404, in 28° 44′ N. lat., 85° 16′ W. lon., at a depth of 60 fathoms; and from station 2417, in 33° 18′ 30″ N. lat., 77° 07′ W. lon., at a depth of 95 fathoms.

CITHARICHTHYS MICROSTOMUS, GILL.

Citharichthys microstomus, GILL, Proc. Acad. Nat Sci. Phila., 1864, 223.
Citharichthys spilopterus, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 817 (not Günther.)

The height of the body enters about 2¾ times (.36–.37) in the extreme length; that of the caudal peduncle about 11 times. The head forms a fifth of the length, is rather abbreviated, scarcely sinuous above the eyes, blunt at the snout, which scarcely exceeds a seventh of the head's length, and the rostral area is rhombic and not higher than long. The eyes are even; the longitudinal diameter contained about 3⅗ times (.05½) in the head's length. The mouth is rather small, the length of the upper jaw only equaling one-fourth of the length, and that of the lower two-fifths of the head's length. The teeth are very small and close together, larger in front. The dorsal commences above the front of the orbit and is highest and convergent near the fortieth ray, which equals about one-tenth of the total length; the anal is highest at about the twenty-fifth ray, and is as high or even higher than the dorsal. The caudal is rounded behind and forms about one-sixth of the length. The pectoral fins are unequally developed, that of the dark side being prolonged and contained only 6¾ times in the total length, while that of the white side only equals one tenth of the same; the rays are also simple. The ventral fins are also unequally developed, the right being on the abdominal ridge at its origin, rather in advance of the opercular margin, and with its longest rays contained about 14 times in the total length; stretched backwards it extends to the second anal ray; the fin on the white side is more advanced, wider, and its rays longer, contained less than 12 times in the length, and extends backward to nearly the third anal ray.

Radial formula: D. 81; A. 58; C. 4, 6, 5, 3; P. 10; V. 6.

The scales are large, angular behind, covered with smaller ones, especially near the point of conjunction of contiguous ones, where alone they are developed on the blind side; the scales of the eyed side are mostly minutely ciliated behind, unarmed, however, near the lateral line, the scales of which last are quadrate and mostly covered; the scales of the blind side are less angular behind and unarmed. The lateral line runs through about 42 scales, while of longitudinal rows there are 10 above and 14 below the lateral line.

The color is uniform reddish brown. A single specimen, little more than 3 inches long, was first obtained by Prof. Baird at Beeseley's Point. It is especially distinguished from its California relative, *O. sordida*, by the shorter snout, small mouth, and large scales, *O. sordida* having about 58 scales pierced by the lateral line and 18 rows above the lateral line. Notwithstanding this great disparity in the size of the scales and mouth *C. micro-stomus* appears to agree in most respects with the California fish, as well as generically with *Citharichthys spilopterus* of Günther, a species inhabiting the Gulf of Mexico.

As the name *Citharichthys* was probably introduced a short time before *Orthopsetta*, pro-posed for the *Psettichthys sordidus*, and was framed for a species related to that type, that name must be adopted if the *O. sordida* is not regarded as generically distinct.

We may here remark that, although I have referred the *Platessa quadrocularis* of Storer to the genus *Chænopsetta* (*C. oblonga*), it is possible that it may not truly belong to that genus, as the dorsal and anal fins are represented as increasing backwards till near their ends, and the anterior dorsal rays are free at their ends; but as the species agrees so closely in other external characters we feel compelled to retain it in that genus for the present at least.

A specimen (D. 77; A. 61; V. 6; L. lat. 40) was taken by the *Albatross* from station 2417, in 33° 18′ 30″ N. lat., 77° 07′ W. lon., off Cape Fear, at a depth of 95 fathoms.

CITHARICHTHYS SPILOPTERUS, GÜNTHER. (Figure 370.)

Citharichthys spilopterus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 421.

The height of the body is two-fifths of the total length (without caudal), the length of the head two-sevenths. Scales of the lateral line subquadrangular; lateral line nearly straight, gently descending anteriorly. Snout with the jaws equal in front, rather longer than the eye, the diameter of which is one-sixth of the length of the head. The maxillary, the length of which is contained twice and two-thirds in that of the head, extends beyond the middle of the orbit. Anterior teeth in the upper jaw widely set, much larger than the posterior, which are close together and very small; the lower jaw with seven or eight distant teeth of moderate size on each side. Eyes separated by a very narrow scaleless ridge, their front margins being nearly on the same level. Fin-rays scaly. The dorsal commences a little before the upper eye, and terminates close by the caudal; its longest rays are behind the middle, and one-half of the length of the head. Anal spine none. Caudal rounded; its length is one-sixth of the total. The pectoral is rather longer than half the length of the head; ventral much shorter, extending beyond the origin of the anal. Gill rakers lanceolate, pointed, one-third as long as the eye.

Radial formula: D. 76–78; A. 60–63; L. lat. 47–50.

Color, grayish olive (in spirits); a series of distant blackish spots along the basal portions of the anal and dorsal fins.

The species has been taken on the Atlantic coast of tropical America and on the west coast of Africa. A single specimen was taken by the *Blake* from station CCXLIV, in 23° 13′ N. lat., 89° 10′ W. lon., at a depth of 84 fathoms.

CITHARICHTHYS DINOCEROS, GOODE and BEAN.

Citharichthys dinoceros, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, No. 5, 157.

Greatest height of the body (40 millimeters) is contained 2.3 times in the total length, and equals about 4 times the least height of the tail.

Scales thin, deciduous, cycloid, large, 48 in the lateral line, which is slightly curved over the pectoral; 14 above and 16 below the lateral line.

The length of the head (27 millimeters) is contained 3⅓ times in the total length, and equals about 3⅓ times the diameter of the eye (8 millimeters). The interorbital space is very narrow, its width less than one-fifth diameter of eye; ridge rather prominent, narrow, sharp.

The upper eye distant from profile by a space (2 millimeters) about one-fourth of the orbital diameter.

The length of the maxillary (12 millimeters) is less than half the length of the head; that of the mandible (16 millimeters) more than half, and twice the diameter of the eye.

The teeth uniserial in both jaws, those in the front much the largest. A strong spine upon the snout overhanging the upper lip (much lower than in *C. unicornis*). Above this there is a second, shorter spine.

The dorsal fin begins upon the snout in advance of eye upon blind side. It is composed of 91 rays, the longest somewhat behind the middle of the fin; its height (13 millimeters), about equal to half the length of the head.

The anal fin originates about under the origin of the pectoral; its distance from the snout (30 millimeters) equals one-third of the total length. It is composed of 73 rays, and is as high as the dorsal.

Caudal subsessile, pointed, its length (17 millimeters) contained about 5⅓ times in total length, and equaling twice the diameter of the orbit.

The pectorals originate immediately behind the branchial opening, far below the lateral line. The third and fourth rays of the fin upon the eyed side elongated. Its length (38 millimeters) is contained 2½ times in total length. This fin has 10 rays; that of the blind side contains 6 rays; its length (12 millimeters) is less than one-third that of its mate, and is less than half the length of the head.

The ventral on the eyed side originates upon the ventral ridge at a distance from the snout (27 millimeters) equal to the length of the head; it contains 5 rays, the length of the first (6½ millimeters) contained 4 times in length of the head. The ventral of the blind side has 6 rays; its length is contained 2⅔ times in length of the head.

Radial formula: D. 91; A. 73; P. 10/6; V. 5. L. lat. 48; L. transv. 14/16.

Color, grayish brown above, white below.

The type specimen, 92 millimeters long to base of caudal, was taken by the *Blake* from station XXI, off Guadaloupe, in 175 fathoms. Additional examples were obtained by the same vessel from station XXVI, off Ste. Lucie, in 110 fathoms; and from stations XIX, XXVIII and XXIX, off Barbados, in 310, 863, and 955 fathoms respectively.

CITHARICHTHYS PÆTULUS, (GOODE and BEAN), JORDAN and GILBERT. (Figure 373.)

Hemirhombus pœtulus, GOODE and BEAN, Proc. U. S. Nat. Mus., v, Sig. 26, Sept. 12, 1882, 414 (specimen from Pensacola, Florida).—JORDAN, *op. cit.*, 304, quoting "Bean MSS." (from stomach of redsnapper, Pensacola.)

Citharichthys pœtulus, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 904.

Citharichthys (*Aramaca*) *pœtulus*, JORDAN and GOSS, Cat. Fish. N. Amer., 1885, 133.

Citharichthys aramaca, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 816 (not *Hemirhombus aramaca*, Auctorum).

Body sinistral; general form that of an ellipse, the caudal extremity being considerably produced. Its height is contained 2¼ times in its length, 2⅔ times in its length to the end of the caudal fin, and is 4 times the height of the tail at its lowest portion. Its height at the ventrals is 3 times as great as at the tail. Its greatest width is equal to the diameter of the upper orbit.

The scales on the cheek of the blind side are arranged in 13 series; those upon the nape and interorbital space of the eyed side are smaller than upon the body. The scales on the body are large, thin, deciduous, and cycloid. There are 57 scales in the lateral line, 54 of which are tube-bearing. Lateral line straight, and over the axis of the body, save in its anterior fourth, within which it slightly ascends with a very gentle curve, to the upper angle of the gill opening. Above the lateral line are 13 scales; below, 22. The vertical fins are scaly two-thirds of the distance to their tips.

The head is short, its length being contained 3⅔ times in the standard body length, 4½ times in the total length, and 1⅔ times in the greatest height of body. The snout is short; its length, slightly less than the diameter of the lower eye, is contained 5 times in the length of the head. Mouth rather large, the upper edge somewhat curved, its cleft very oblique, the maxillary extending to below the middle of the lower eye. The lower jaw extends to the vertical from the anterior margin of the upper eye. Length of the upper jaw equals one-third the distance from the snout to the insertion of the anal. The lower jaw equals the distance from the tip of the snout to the posterior margin of the lower eye and is contained 2⅓ times in the length of the head. Teeth moderate, equally developed on both sides, in two rows in the upper jaw, those of the outer row upon the blind side of the upper jaw and the anterior portion of the eyed side considerably larger than those in the inner row. The teeth of the lower jaw uniserial, almost as large as in the outer row of the upper jaw.

The eyes are large, prominent, and far apart. Their longitudinal diameter equals the length of the snout, and is contained 5 times in the length of the head. Their vertical diameter is about three-fourths as great as their longitudinal diameter. The lower eye is far in advance of the upper, the vertical from the anterior margin of the upper orbit cutting the lower orbit at a point about two-thirds the distance from its anterior to its posterior margin. The upper eye is close to the dorsal profile, separated from it by a distance equaling about one-half its longitudinal diameter. The interorbital space is flattish and uneven, its width being contained 4 times in the length of the head. A prominent ridge extends from the upper posterior margin of the lower eye to the lower posterior margin of the upper eye, thence widening and curving downward to the upper angle of the branchial aperture. The margin of the preoperculum is also somewhat elevated. The length of the operculum is very slightly greater than the width of the interorbital space.

There are 11 short and thick gill rakers on the anterior arch, the longest equal in length to one-third the diameter of the eye.

The dorsal fin begins on the blind side of the body in advance of the anterior margin of the lower eye; its anterior rays are almost free, the longest rays behind its middle, its greatest height equal to the length of the upper jaw.

The anal is inserted under the anterior angle of the pectoral axilla. Its anterior rays are less free than are those of the dorsal, about two thirds of their length being extruded from their membrane. Its outline similar to that of the dorsal, but greatest height somewhat less, being one-third the length of the head.

The greatest length of the caudal equals the length of the head without the snout, and one-fifth of the body length. Its middle rays are somewhat longer than the outer rays, giving to the posterior margin the outline of an obtuse angle.

The pectoral is inserted at the tip of the opercular flap; its second and third rays much produced in a filamentous extension. Its greatest length slightly exceeds 1⅓ times that of the head. The pectoral on the blind side has no prolonged rays; its greatest length equaling that of the upper jaw.

The ventral on the eyed side is inserted on the ridge of the abdomen slightly behind its mate, which is a little removed from the medial line.

Distance between insertion of the ventral and the snout equals one-fourth the length of the body. The length of the ventral equals one third that of the head. Vent close to the origin of anal, and slightly removed from the medial point of the body on the blind side; behind it a small papilla, one fourth as long as the eye.

Radial formula: D. 87: A. 67; C. 8+7: P. 11 sinistral and 9 dextral; V. 5; scales 13–57–22.

Color, eyed side, grayish brown; blind side, somewhat clouded with darker shade.

The width of the interorbital space in the type exceeded the diameter of the eye. In some smaller ones the space is about equal to the length of the eye. while in still younger ones it is less than the diameter of the eye.

The type (Cat. No. 30180, U. S. N. M.) was obtained by Silas Stearns, at Pensacola, Fla. Specimens were taken by the *Blake* from station CCIX, in 24° 43′ N. lat., 83° 25′ W. lon., at a depth of 37 fathoms; from station CLXVII, in 24° 46′ N. lat., 83° 16′ W. lon., at a depth of 36 fathoms; from station XX, off Flannegan's Passage, in 27 fathoms; from station CXCII, in 23° 13′ N. lat., 84° 16′ W. lon., at a depth of 84 fathoms; from station CCLII, on the Alacran Shoals, in 35 fathoms; also by the *Albatross* from station 2387, in 29° 24′ N. lat., 88° 04′ W. lon., at a depth of 32 fathoms; from station 2388, in 29° 24′ 30″ N. lat., 88° 01′ W. lon., at a depth of 35 fathoms; from station 2403, in 28° 12′ 30″ N. lat., 85° 29′ W. lon., at a depth of 88 fathoms; from station 2411, in 26° 33′ 30″ N. lat., 83° 15′ 30″ W. lon., at a depth of 27 fathoms; from station 2413, in 26° 00′ N. lat., 82° 57′ 30″ W. lon., at a depth of 24 fathoms; from station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms; from station 2414, in 25° 04′ 30″ N. lat., 82° 59′ 15″ W. lon., at a depth of 26 fathoms; from station 2406, in 28° 46′ N. lat., 84° 49′ W. lon., at a depth of 26 fathoms; and from station 2408, in 28° 28′ N. lat., 84° 25′ W. lon., at a depth of 21 fathoms.

ETROPUS, Jordan and Gilbert.

Etropus, JORDAN and GILBERT, Proc. U. S. Nat. Mus., 1881, 364; Bull. XVI, U. S. N. M., 1883, 839.

Eyes and color on the left side. Body regularly oval, deep, and compressed. Head small; mouth very small, the teeth close-set, slender and pointed, somewhat incurved, mostly on the blind side; no teeth on vomer. Eyes small, separated by a narrow, scaleless ridge; margin of preopercle free. Ventrals free from anal, that of colored side inserted on ridge of abdomen, its base rather long. Dorsal fin beginning above eye; caudal double truncate; anal without spine. Scales thin, deciduous, ctenoid on left side, cycloid on blind side. Lateral line simple, nearly straight. Size small. Genus apparently allied to *Citharichthys*, although the mouth is very small. (*Jordan* and *Gilbert.*)

ETROPUS RIMOSUS, GOODE and BEAN. (Figures 360, 361).

Etropus rimosus, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 593.

Body pear-shaped, its height (54 millimeters) slightly exceeding half its length.

Scales large, strongly pectinated on both sides, about 41 in the longitudinal series, 12 above and 14 below the lateral line. Lateral line equally developed on both sides, very slightly curved above the pectoral. Head entirely covered with scales. Numerous small supernumerary scales between the normal scales covering their surface.

Length of head (24 millimeters) slightly less than one-fourth of the total length. Snout very short, its length (3 millimeters) 8 times in that of head. Mouth very small, its cleft less than diameter of orbit, its angle reaching about to vertical through anterior margin of lower eye.

The length of the maxilla (5 millimeters) somewhat less than one-fourth that of head. Length of mandible considerably more than one-third of the same length.

Teeth well developed on blind side in both jaws, also on the colored side of lower jaw in front.

Eyes moderate (7 millimeters), their diameter contained nearly 3½ times in length of head, placed in the same vertical, the upper eye close to the dorsal profile, and separated from its mate by a space less than one-third of its own diameter. Interorbital ridge low.

Nostrils in line with the interorbital ridge, each in a short tube, the posterior being the larger. The anterior nostril is equidistant from the tip of the snout and the lower orbit. Dorsal fin commencing at a point upon the blind side of the snout in the vertical through the anterior margin of the eye, containing 77–78 rays, the longest somewhat behind the middle of the fin, its length about 7 times in total length.

Anal fin commencing under the base of the pectoral, composed of 61 rays, the longest post-medial as long as the longest in the dorsal. Anal papilla prominent.

Caudal fin rounded, the middle rays about as long as the head.

Pectorals normally placed, that upon the colored side longest, equal in length to that of the head without the snout.

Ventral of eyed side on ridge of abdomen, its base rather long but not reaching anal origin; that of blind side farther forward, its length equal to that of its mate, and a little more than one-tenth of the total. Vent at the anal origin slightly lateral.

Color, gray, hoary above, with a few irregularly placed indistinct brownish blotches, none of which are larger than the eye. White below.

Radial formula: D. 77–78; A. 61; V. 6; P. 9–11; C. 17; scales, 41.

The type is Cat. No. 37332, 100 millimeters long; it is from station 2408, *Albatross*, N. lat. 28° 28′, W. lon. 84° 25′, depth 21 fathoms.

CYCLOPSETTA, Gill.

Cyclopsetta, GILL, Proc. U. S. Nat. Mus., 1888, 601.

Psettines with the body oblong rhombo-ovate, covered with regularly imbricated moderate cycloid scales; lateral line nearly rectilinear on both sides; snout convex; mouth very large; jaws squarely truncated behind; teeth uniserial, those of upper jaws moderate, of lower jaw enlarged and largest at sides; dorsal and anal almost symmetrical, dorsal commencing in front of eye on snout, scarcely deflected on blind side; caudal slightly pedunculate and convex; pectorals subequal and with a subtruncate free margin; ventrals nearly equal, the left on the preanal ridge, the right lateral, both with the inner rays connected by membrane to the body; interbranchial membrane imperforate; gill rakers tubercular and surmounted by blunt denticles.

The scales on the eyed side are regularly cycloid with the nucleus some distance from the posterior margin and with numerous radiating striæ. The gill rakers are quite characteristic.

CYCLOPSETTA FIMBRIATA, GOODE and BEAN. (Figure 368.)

Hemirhombus fimbriatus, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 591.

Body elliptical; its height (102 millimeters) nearly half the body length.

Scales cycloid, about 70 in the longitudinal series, 25 or 26 in the vertical series above the lateral line, 31 below. The lateral line is slightly curved over the pectoral, the length of the arc of the curve contained 3⅛ times in its straight portion. Vertical fins not scaly.

Length of head (61 millimeters) about 3½ times in standard length. Length of snout (11½ millimeters) 5¼ times in that of head.

Mouth very large, with upper jaw strongly curved, lower jaw included. The length of the maxillary (30 millimeters) equals half the length of the head. The lower jaw extends behind the vertical through the posterior margin of the eyes; its length (36 millimeters, equal to that of postorbital part of the head, and contained 6 times in the total length) Edge of mandible and margin of suboperculum provided with a pointed flap of thin integumentary tissue. Gill rakers very short, tubercular; about 9 on the anterior arch below the angle. The upper eye is placed at a distance from the dorsal profile equal to half its own diameter, which is a little more than one-fifth the length of the head, and is equal to that of its mate. Eyes in the same vertical and separated by an interspace equal to one-fourth the orbital diameter. Interorbital ridge low.

Nostrils on the line of the interorbital ridge; the anterior is equidistant from the tip of the snout and the margin of the upper eye; it is in a very inconspicuous tube, provided with a slender filament about one-third the length of the snout. The posterior nostril is separated from the anterior one by a space equal to one-fifth the length of the snout.

Teeth uniserial in both jaws, some of the anterior ones in the upper jaw being much larger than those following, while those in the lower jaw are still larger than these. Some of the teeth in each jaw are depressible.

The dorsal fin begins on the snout, in advance of the nostrils; the first ray longer than the second. The longest rays are behind the middle of the fin, their length (26 millimeters) one-fourth the height of the body. Eighty rays compose the fin.

The anal fin begins under the axil of the pectoral. Its longest rays behind its middle, their length (30 millimeters) greater than that of longest dorsal rays. It contains 60–61 rays.

Caudal with middle rays produced, the length of the median rays (45 millimeters) contained 4⅕ in total length.

The greatest length of the pectorals (39 millimeters) is contained 5½ times in total length.

The ventral of the colored side is on the ridge of the abdomen, on a line with its mate, which is slightly removed from the median line. Its distance from snout (56 millimeters) a little more than one-quarter the length of the body. Its length (23 millimeters) equal to half the length of median caudal rays. The ventral of the blind side is continued by a thin membrane to the vent, which is slightly distant from the edge of the abdomen, and behind the origin of the anal.

Color, grayish-brown; the dorsal and anal fins each with two roundish dark blotches upon their posterior halves, which are slightly larger than the eye. A similar dark blotch upon the middle of the caudal, sometimes with smaller blotches irregularly placed near its outer margin.

Pectoral, with a very narrow dark band near its base; the whole of its outer half is marked by a dark blotch, reticulated and mottled with lighter; the intervening portion is pearly-white, with dark specks upon the rays. Blind side cream colored.

D. 80; A. 60–61; P. 10; V. 6; C. 16.

The type specimen (Cat. No. 37330, U. S. N. M., 213 millimeters long to origin of middle caudal rays), was taken by the *Albatross* from station 2403, in 28° 42′ 30″ N. lat., 85°

29′ W. lon., at a depth of 88 fathoms. Two additional specimens (Cat. No. 37831 U. S. Nat. Mus.) were secured by the same vessel from station 2407, in 28° 47′ 30″ N. lat., 84° 37′ W. lon., at a depth of 24 fathoms. The examples obtained are all from the Gulf of Mexico, between the delta of the Mississippi River and Cedar Keys, Florida.

MONOLENE, Goode.

Monolene, GOODE, Proc. U. S. Nat. Mus., III, sig. 22, Nov. 23, 1880, 338.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 194.—JORDAN and GILBERT, Bull., XVI, U. S. Nat. Mus., 840.—GÜNTHER, Challenger Report, XXII, 1887, 165.
Thyris, GOODE, Proc. U. S. Nat. Mus., III, 344, Nov. 23, 1880 (based on young).
Delothyris, GOODE, Proc. U. S. Nat. Mus., VII, 1884, 143.—GÜNTHER, Challenger Report, XXII, 1887, 160, note.

Pleuronectoids with thin elongate body and sessile caudal fin. Eyes upon left side very close together, and near to profile. Mouth moderate; the length of the maxillary less than one-third that of the head. Teeth minute in the jaws, in single series, nearly equal on both sides, though perhaps a trifle stronger on the blind side; absent on vomer and palatines. Pectoral fin upon blind side totally absent. Dorsal fin commences in advance of the eye upon the snout. Dorsal and anal rays simple. Caudal fin sessile, almost confluent with dorsal and anal. Ventrals normal. Scales rather large, ctenoid upon colored side, cycloid upon blind side. Lateral line marked; on colored side strongly and angularly curved above the anterior two-thirds of the pectoral; on the blind side straight, rising slightly as it approaches the region of the gill opening. Gill rakers few, feeble. Vertebræ 43.

MONOLENE SESSILICAUDA, GOODE. (Figures 357, A and B.)

Monolene sessilicauda, GOODE, Proc. U. S. Nat. Mus., III, sig. 22, Nov. 23, 1880, 338; *ibid*, 472.—JORDAN and GILBERT, Bull. XVI, U. S. Nat, Mus., 841.—GÜNTHER, Challenger Report, XXII, 1887, 165.
Thyris pellucidus, GOODE, Proc. U. S. Nat. Mus , III, 1880, 344 (young specimen).
Delothyris pellucidus, GOODE, *ibid*, VII, 1884, 143.

The height of the body (38) is about three-eighths of the total length (without caudal), and is equal to twice the distance of the origin of the ventral from the snout (19); its height over the ventrals (25) is about five times the longitudinal diameter of the lower eye (5), the least height (8.5), at the base of the tail, slightly greater than the length of the lower jaw (8). Body thin, its greatest width (5) not exceeding the longitudinal diameter of the orbit.

Scales subcircular, with irregular outline, about 2 millimeters in diameter, or about one-fourth (1.25) the diameter of the eye. The posterior edge of each of the scales upon the colored side is pectinate with about fifteen denticulations. The scales of the blind side are oval, nonpectinate, about as large as those of the colored side. The head is everywhere closely thatched with scales, even to the edges of the lips, and small scales occur on the bases of the caudal, pectoral, and ventral fins, and upon the rays of the vertical fins nearly out to their tips. There are about 23 rows above and 25 below the lateral line on the colored side, behind the curve of the line.

Lateral line of colored side strongly bent in its anterior part over the base and anterior two-thirds of the pectoral fin. There are about 92 scales in the lateral line, 72 of them in its straight portion. The arc of the curved portion of the lateral line (12) is slightly more than double the distance of its highest portion above the line of the straight portion of the line were it continued (5). The curve of the line is very peculiar, having two angles, that nearest the head being more obtuse. The lateral line on the blind side is nearly straight, slightly ascending above the abdominal cavity.

The length of the head (20) equals one-fifth of the standard length, and four times diameter of eye, or length of operculum (5). Distance from snout to margin of upper eye (5) much greater than distance to lower eye (3), and less than length of the maxillary (5.5), the posterior margin of which passes the perpendicular from the anterior margin of the lower eye. The width of the interorbital area is very small, less than one-sixth of the diameter of the eye. The length of the mandible (8) is two-fifths of the head.

The dorsal fin begins upon the snout in the perpendicular from the anterior margin of the lower eye. It is composed of from 99 to 104 simple rays (in 5 specimens), the longest of which in the posterior fourth of the fin; their length (9) nearly half that of the head. The anal fin begins between the tips of the ventral, close to the vent, and under the insertion of the pectoral. It is composed of 79 to 84 simple rays, the longest in the posterior fourth; their length (7) slightly more than one-third the length of the head.

The caudal is sessile, rounded, the middle rays in length (17) nearly double the longest dorsal rays.

The pectoral, present only on the colored side, is inserted close to the branched opening, its length (15) three-fourths that of the head.

The ventrals are upon the median ventral line, even in length (6), slightly shorter or nearly equal to the longest rays of the anal.

Color on the left side ashy brown, with numerous more or less distinct darker brown spots. On the blind side white. Pectoral blackish, with traces of lighter transverse bands.

Radial formula: D. 99–103; A. 79–84. Lateral line, 92.

Current number of specimen	26,004.		26,004b		26,004c		26,004e.	
Locality	870.							
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length	156							
Length to end of middle caudal rays	133	100						
Body:								
Greatest height		38						
Greatest width		5						
Greatest circumference		25						
Height at ventrals		25						
Least height of tail		8.5						
Head:								
Greatest length		20						
Distance from snout to upper eye		5						
Width of interorbital area		7.5						
Distance from snout to lower eye		2						
Length of operculum		5						
Length of maxillary		5.5						
Length of mandible		8						
Diameter of orbit, longitudinal		5						
Dorsal (spinous):								
Distance from snout		3						
Greatest height		9						
Anal:								
Distance from snout		22						
Height at longest ray		7						
Caudal, length of middle rays		17						
Pectoral:								
Distance from snout		21						
Length		15						
Ventral:								
Distance from snout		19						
Length		6						
Dorsal		103		102	99		103	103
Anal		84		81	81			79
Number of scales in lateral line		92						
Number of transverse rows above lateral line		(23)						
Number of transverse rows below lateral line		(25)						
Number of vertebræ		5						

The young form of *Monolene* described by Goode under the name *Thyris pellucidus* (Fig. 359) is so remarkably distinct, that the description is given here:

The length of the specimen described (No. 26005) is 72 millimeters.

The height of the body (32) is about one-third of its length (without caudal), the least height of the tail (7) one-fourteenth. The body is thin, pellucid, larval-like, divided into three longitudinal tracts by depressions at the bases of the rows of interspinous processes, as in *Glyptocephalus*.

The scales are small, thin, easily detached (none remain upon the specimen except a few in the lateral line). The number of transverse rows is estimated at 120, the number of rows above and below the lateral line at the widest portion of the body 17 or 18. The scales in the lateral line are provided with a large central canal. The lateral line is straight on both sides.

The head is very small; its length (18) contained about five and one-half times in the total length of the body. The eyes are small, protruding, the upper almost perpendicularly above, though perhaps slightly posterior to the lower. The diameter of the eye (2) equals the width of the interorbital space (2) and is double the distance (4) from the snout to the upper eye, that from the snout to the lower eye (3) being intermediate. The mouth is small, the shape of the opening being somewhat like that in *Solea*, the upper jaw being somewhat hook-shaped. The length of the upper jaw (4) is two-thirds that of the mandible (6).

The dorsal commences on the snout in advance of the eye, and is composed of 96 to 102 long, flexible, simple rays, their tips apparently extending far beyond the connecting membrane. The length of the longest rays (14) is double the least height of the body at the base of the tail (7).

The anal fin originates at a distance (22) from the snout contained four times and one-half in the length of the body. It is composed of 76 to 81 rays, the longest of which are as long as the head.

The pectoral is inserted close to the gill opening and far below the lateral line (midway from the black stripe upon the lateral line to the black stripe at the base of the interspinous processes of the anal fin). The pectoral upon the blind side is short, its length (2) equal to the diameter of the orbit, composed of about four or five rays; that upon the colored side longer, its length (3) equal to that of the snout, and composed of about twelve rays. The ventrals are both crowded upon the ventral keel, their bases prolonged upon the keel, their tips embracing the origin of the anal.

Radial formula: D. 96–102; A. 76–81; P. 12 left, 4–5 right.

Color: In life colorless, translucent. In alcohol yellowish white. Three prominent blackish longitudinal stripes or lines upon the left side. The stripe running from the branchial cleft to the base of the tail is less prominent than the two at the bases of the interspinous processes. On the lateral line of the right side there is no stripe, though the two lateral stripes are as prominent as upon the other side. Eyes black.

Current number of specimen	20,005.	
Locality	870, 871, and 872.	
	Millimeters.	100ths of length.
Extreme length	72	
Length to end of middle caudal rays	60	100
Body:		
Greatest height		32
Least height of tail		7
Head:		
Greatest height		18
Distance from snout to upper eye		4
Distance from snout to lower eye		3
Width of interorbital area		2
Length of maxillary		4
Length of mandible		6
Diameter of orbit		2
Dorsal (spinous):		
Distance from snout		2.5
Greatest height		14
Anal:		
Distance from snout		22
Height at longest ray		18
Caudal length of middle rays		19
Pectoral:		
Distance from snout		18
Length		3–2
Ventral distance from snout		16
Dorsal		96–102
Anal		76–81
Pectoral		12 L., 4–5 R.
Number of scales in lateral line		*120

* Estimated from partial count.

The type specimen of *Monolene sessilicauda* (Cat. No. 26004, U. S. N. M.), .156 meter long, was taken by the *Fish Hawk*, together with 10 other specimens, from station 870, in 40° 02′ 36″ N. lat., 70° 22′ 58″ W. lon., at a depth of 155 fathoms, and from station 871, in 40° 02′ 54″ N. lat., 70° 23′ 40″ W. lon., at a depth of 115 fathoms. Examples were also obtained by the same vessel as follows: Cat. No. 26099, U. S. N. M., from station 876, in 39° 57′ N. lat., 70° 56′ W. lon., at a depth of 120 fathoms; Cat. No. 26109, U. S. N. M., from station 877, in 38° 56′ N. lat., 70° 54′ 18″ W. lon., at a depth of 126 fathoms; Cat. No. 26005, U. S. N. M., from station 871, in 40° 20′ 54″ N. lat., 70° 23′ 40″ W. lon., at a depth of 115 fathoms; Cat. No. 26006, U. S. N. M., from station 872, in 40° 05′ 39″ N. lat., 70° 23′ 52″ W. lon., at a depth of 86 fathoms; Cat. No. 28981, U. S. N. M., from station 1038, in 39° 58′ N. lat., 70° 06′ W. lon., at a depth of 146 fathoms; and Cat. No. 28740, U. S. N. M., from station 923, in 40° 01′ N. lat., 70° 46′ W. lon., at a depth of 98 fathoms.

The *Blake* took it from station XVIII, off Barbadoes, at a depth of 209 fathoms; from station CLXXV, off Alligator Keys, at a depth of 85 fathoms; and from station CCCXIV, in 32° 24′ N. lat., 78° 44′ W. lon., at a depth of 142 fathoms. Additional specimens were secured by the *Albatross* from station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms; from station 2091, in 40° 01′ 50″ N. lat., 70° 59′ W. lon., at a depth of 117 fathoms; from station 2378, in 29° 14′ 30″ N. lat., 88° 09′ 30″ W. lon., at a depth of 68 fathoms; from station 2314, in 32° 43′ N. lat., 77° 51′ W. lon., at a depth of 159 fathoms; from station 2423, in 37° 10′ 15″ N. lat., 74° 32′ W. lon., at a depth of 143 fathoms; from station 2552, in 39° 47′ 07″ N. lat., 70° 35′ W. lon., at a depth of 721 fathoms; from station 2537, in 39° 56′ 45″ N. lat., 70° 50′ 30″ W. lon., at a depth of 156 fathoms; and from station 2545, in 40° 01′ N. lat., 70° 23′ 45″ W. lon., at a depth of 142 fathoms.

MONOLENE ATRIMANA, GOODE and BEAN. (Figure 358.)

Monolene atrimana, GOODE and BEAN, Bull. Mus. Comp. Zool., XII, 155.

Height of the body (37) is one-third of the total length without the snout, and equals 4 times the long diameter of the eye; it also equals 1⅜ times the distance of the ventral origin from the snout. The height at the origin of the ventrals (29) equals about 3 times the length of the lower eye (9). The least height at the base of the tail (8) equals four-fifths of the length of the mandible (10). The body is thin, its greatest width (4½) equaling one-half the length of the eye.

Scales ovate or oblong, smaller than in *M. sessilicauda*, and without evident pectinations. The head is everywhere scaly except on the lips and the anterior half of the snout. The scaling of the fins is essentially the same as in *M. sessilicauda*. There are 30 rows of scales above, and 32 below the lateral line on the colored side.

The lateral line of the colored side is strongly arched in its anterior part over the base and anterior third of the pectoral fin. The arc of the curved portion of the lateral line (10) equals 2½ times the height of the curve (4). The curve is entirely similar to that in *M. sessilicauda*. The lateral line of the blind side is nearly straight, very slightly ascending anteriorly. There are 105 scales in the lateral line to caudal base, 18 of these in the curved portion.

The length of the head (24) equals two ninths of the standard length, and 2⅔ times the diameter of the eye. The distance from the snout to the front of the upper eye (6) is much greater than the distance to the lower eye (3). The interorbital area is a mere narrow ridge, whose width (1) equals only one ninth of the length of the eye. The length of the maxilla (8) equals one-third the length of the head, and on account of its oblique position its hind margin does not extend much beyond the vertical through the front margin of the lower eye. The length of the mandible (10) equals five-twelfths of the head's length. The teeth are uniserial and well developed on both sides. The nostrils are in very short tubes, in the same line with the interorbital ridge, the posterior one being slightly less distant from the lower eye than the anterior is from the tip of the snout. A concavity above the snout.

The dorsal fin begins upon the snout on the blind side in the perpendicular through the front of the lower eye. It contains 124 simple rays, the longest rays being in the posterior fourth of the fin, and one-half as long as the head. The anal fin begins between the tips of the ventrals and under the origin of the pectoral. The vent is not on the ventral outline, but on the blind side and close to the beginning of the anal fin. The anal is composed of 100 simple rays, the longest (14) being behind the middle of the fin and slightly longer than the longest of the dorsal (13). The caudal is sessile, rounded, the middle rays (20) about one-sixth of standard length of body. The pectoral is present only on the colored side, is inserted close to the edge of the operculum, its length (27) exceeding that of the head, and contained 4¼ times in the standard length. The ventral of the colored side is nearly on the ridge of the abdomen, while that on the blind side is mostly lateral, and slightly larger than its fellow. The length of the left ventral (7) is about 3½ times in length of head.

The color on the left side is light brownish gray; the fins are mostly dusky except the right ventral, which is pale; the pectoral and the eyelids are black.

D. 124; A. 100; V. 6; P. 12; scales 30–105–32 (18 in curved portion of lateral line).

A single specimen, the type (XVI), 114 millimeters long, was taken by the *Blake* off Barbados in 288 fathoms, and another one (XVII) in the same locality at a depth of 218 fathoms.

Family SOLEIDÆ.

Soleidæ, GILL, Arr. Families of Fishes, 1872, 2 (to include Günther, IV, 462–504, name only); Century Dictionary, 5755.

Heterosomata with body oval or elliptical, and nearly equally developed above and below the lateral line. Scales small (ctenoid or cycloid), or absent; the lateral line usually straight (sometimes double or triple). The head small, with rounded, projecting snout, and upper jaw more or less hooked. Opercular bones concealed by the integument. Eyes approximated, the upper more or less advanced; the opercula concealed by the scales. Mouth unsymmetrical and rather small and curved; teeth some times wanting, generally confined to the blind side of the jaws, and villiform. Branchiostegal rays usually 7.

Dorsal, anal, and caudal fins usually separate, sometimes confluent. The dorsal origin is on the snout, the anal under the pectoral; pectorals small or absent; ventrals small and variously developed. Vertebræ very numerous, but unequally distributed, in the typical forms the abdominal or rib-bearing ones being only 8 or 9 in number, and the caudal about 40.

The family is well distinguished from the *Pleuronectidæ*, especially so far as the European and American species are concerned, though some Australian forms are intermediate. (*Gill.*)

KEY TO DEEP-WATER GENERA OF SOLEIDÆ.

I. Mouth small, twisted.
  A. Body dextral. Lateral line straight .... *Soleinæ*
    1. Pectorals well developed .... SOLEA
    2. Pectorals minute .... MICROCHIRUS
  B. Body sinistral. No pectorals .... *Cynoglossinæ*
    1. No lateral line .... APHORISTIA
    2. One lateral line .... AMMOPLEUROPS
    3. Three lateral lines .... ARELIA

SOLEA, Cuvier.

Solea, (QUENSEL), GÜNTHER, Cat. Fish. Brit. Mus., IV, 462.

Dextral pleuronectoids, having a narrow, twisted mouth, and teeth in villiform bands, on blind side only; palatines and vomerines toothless. Origin of dorsal on snout. Scales ctenoid; lateral line straight. Nostrils of blind side not dilated.

This genus, or group of genera, is of world-wide distribution, except in very cold water It is almost restricted to sandy bottoms at moderate depths.

SOLEA VULGARIS, QUENSEL.

Pleuronectes solea, LINNÆUS, Systema Naturæ, ed. x, 1758, I, 270; ed. XII, 1766, 457.
Solea vulgaris, QUENSEL, Vet. Akad. Handl., 1806, 230.—RISSO, Hist. Nat. Eur. Mérid., III, 247.—BONAPARTE, Fauna Italica, Pesci, fasc. v.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 463.—VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 189.

Body elongate-ovate, its height little more than one-third of its length. Well-developed pectorals on both sides. Interorbital space two-thirds of length of snout. Lateral line straight, containing about 160 scales.

Radial formula: D. 73–84; A. 61–73.

Color greenish or brownish-gray, spotted with brown; pectoral of right side with a black or blackish blotch; left side white.

This species, the common sole, is found from Trondhjems Fjord, 65 N. lat., to Gibraltar, and through the Mediterranean, at least to the head of the Adriatic. Like many shoal-water forms of the north, it occurs in the cooler depths near its southern limit, and the French Expedition found it on the Banc d'Arguin in 235 meters (station XCI).

MICROCHIRUS, Bonaparte.

Microchirus, BONAPARTE, Cat. Med. Pesci d'Europe, No. 429.
Buglossus, (subgenus), GÜNTHER, Cat. Fish. Brit. Mus., IV, 462.

A genus closely related to *Solea*, but perhaps separated by its very minute pectorals.

MICROCHIRUS VARIEGATUS, (DONOVAN), MOREAU.

Pleuronectes variegatus, DONOVAN, Nat. Hist. Brit. Fish., 1808, pl. CXVII.
Solea (Buglossus) variegatus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 1862, 469.—DAY, Fishes of Great Britain and Ireland, II, 43, pl. CVIII, fig. 1.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 190.
Microchirus variegatus, MOREAU, Hist. Nat. Poiss. France, 181, III, 317.
Pleuronectes microchirus, DE LA ROCHE, Ann. Mus., XIII, 356, fig. 2.
Pleuronectes Mangili, RISSO, Ichth. Nice, 1810, 310.
Solea Mangilii, BONAPARTE, Fauna Italica, Pesci, Fasc. v.—CANESTRINI, Arch. Zool., I, 29, pl. III, fig. 3; Pesci d'Italia, 166.
Pleuronectes lingula, PENNANT, British Zoölogy, 1812, III, 313, pl. XLVIII.
Monochirus lingula, COSTA, Fauna Napolitana, II, 50.
Microchirus lingula, BONAPARTE, *loc. cit.*

Sole-like fishes, having body somewhat elongate, its height 2½ to 2⅔ in total length; the length of head 5½. Width of interorbital space equal to length of snout and diameter of orbit, and 4–4½ times in length of head. Pectoral of blind side minute, the other very small, its length 4½ in that of head. Scales in lateral line 85.

Radial formula: D. 63–73; A. 53–57.

Color, brownish-gray, with brown transverse bands; much darker on the vertical fins.

This form occurs as far north as Scotland and England, where it is caught in trawl nets, and has been taken south of Ireland in 150 fathoms; it also occurs along the west coast of France, and in the Mediterranean, as far as to the Gulf of Genoa, and the head of the Adriatic. The French vessels found it off Spain in 60 to 126 meters; off Soudan, in 130 meters; and at 306 meters in the Gulf of Gascony (Travailleur, 1880, station XVII).

MICROCHIRUS PROFUNDICOLUS, (VAILLANT), GOODE and BEAN.

Solea profundicola, VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 190.

A *Microchirus*, having the height of the body one third of its length; the head one-fifth. Snout round, inconspicuous. Mouth small, extending scarcely to the vertical from the middle of the lower eye, with teeth only on the blind side. Upper eye in advance of the lower one and well opened, while the latter is curtained by an eye lid which hides it to a large extent. The diameter of the orbits is about two-fifths the length of the head; width of the interorbital space about one-third less. Lateral lines extending without perceptible curvature from the upper eye to the middle of the caudal. Scales small, ctenoid upon both sides of the body; about 127 in the lateral line, 31 above and 49 below. Dorsal beginning almost over the middle of the upper eye, and extending almost to the base of the caudal rays. Caudal rounded, composed of about 16 rays. Pectoral very small, filiform, with 1 to 3 rays. Ventrals with 4 rays, but slightly developed.

Radial formula: D. 84; A. 69; V. 4.

Color, reddish, gray above; dorsal and anal fins black, excepting the rays, which, being covered with scales, are of the same color as the body. The black tint is especially noticeable on the blind side. Extremities of the rays milky white.

Specimens of this species were obtained by the French explorers at station XXVI, 370 meters; LXI, 1,290 meters—both on the coast of Portugal; station XXXII, in the Gulf of Cadiz, 440 meters, and station LXV, off the coast of Soudan, 250 meters.

APHORISTIA, Kaup.

Aphoristia, KAUP, Wiegmann's Archiv, 1858, 106 (type, *Achirus ornatus*, Lacépède).—GÜNTHER, Cat. Fish. Brit. Mus., IV, 490.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 842.

Sinistral pleuronectoids, having body elongate, lanceolate, rounded forward, tapering behind, much compressed. Mouth small, twisted sinistrally. Teeth minute, dextral only. Snout short, with a hook. One nostril present, before lower eye, with slight barbel. Scales ctenoid, moderate; no lateral line. Vertical fins confluent; pectorals obsolete; ventral only on colored side. Gill-openings narrow.

This genus, hitherto known only from the western Atlantic, has been reported from deep water in the Bay of Bengal, where Alcock recognizes three species: *Aphoristia Wood-Masoni*, Alcock, 475–490 fathoms; *A. Gilesii*, Alcock, 193 fathoms; and *A. septemstriata*, Alcock, 188–220 fathoms.

Aphoristia fasciata, a shallow-water form, is illustrated in pl. CX. (fig. 374) for comparison with the allied species.

KEY TO THE SPECIES OF APHORISTIA.

I. Ventral connate with anal.
  Ventral rays 5.
    Scales moderate, 85–90 rows. D. 95 .... A. FASCIATA
II. Ventral separated from anal.
  A. Ventral rays 5.
    Scales small. 120/50 rows, a single row between the eyes. Body elongate, height 4⅔; Head 5⅔; D. 119 .... A. NEBULOSA
  B. Ventral rays 4.
    1. Scales moderate 80–90/34. None between eyes. Body elongate, height 4¼; Head 5¼; D. 96–100. A. MARGINATA
    2. Scales large, rough, 65/34. Body short, height 3¼; Head 4¼; D. 90 .... A. PIGRA
    3. Scales moderate, 80/35. Caudal 1/10 of total. Eye in the same vertical. Body 3¼; head, 5⅓. A. DIOMEDEANA
    4. Scales moderate. 85–90/38, D. 78; A. 70 .... A. PUSILLA

APHORISTIA NEBULOSA, GOODE and BEAN. (Figure 375.)

Aphoristia nebulosa, GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 1883, 192.—GÜNTHER, Challenger Report, XXII, 1887, 167.

Body is rather slenderer than in other species of the genus; its greatest height (18 millimeters) is contained 4⅔ times in the extreme length. Scales small, rough, about 120 in a longitudinal series; about 50 in a transverse series. Jaws and snout scaleless. Length of the head (15 millimeters) contained 5⅔ times in total length. The length of the snout (3 millimeters) is ⅕ that of the head. Eyes small and close together, being separated by only a single row of scales; upper eye very slightly in advance of the lower. The tubular nostril is directly in front of the lower eye, and a little nearer to it than to the tip of the snout. The length of the eye (2 millimeters) is contained 7½ times in length of head. The angle of the mouth is about in a vertical through the anterior margin of the lower pupil. Teeth feeble, very slender, and rather closely placed, apparently equally developed on the two sides.

Dorsal fin begins at a point slightly behind the eyes; it is connate with the caudal, and contains 119 rays to the middle of the base of the caudal; the rays about the middle of the fin are the longest, their height being a little more than one-third that of the body.

Distance of anal from snout (20 millimeters) contained 4¼ times in extreme length; longest rays about the middle of the fin, their length (6 millimeters) equaling twice that of the snout. Anal connate with caudal, and contains 107 rays, counting to the middle of the base of the latter fin.

Median caudal rays longest, their length (6 millimeters) equaling twice that of the snout.

Pectorals none.

Distance of ventral from snout (15 millimeters) contained 5⅝ times in extreme length. The ventral is separated from the anal by an interspace twice as long as the eye. The number of ventral rays is 5, the longest of them being one-third as long as the head.

Vent near origin of the anal.

Color, grayish, everywhere mottled with brown. Median keel on the scales dark and prominent.

Radial formula: D. 119; A. 107; V. 5; P. none.

A single type specimen, 85 millimeters in length, was obtained by the *Blake* from station CCCXVI, in 32° 07′ N. lat., 78° 37′ 30″ W. lon., at a depth of 229 fathoms.

APHORISTIA MARGINATA, Goode and Bean. (Figure 376.)

Aphoristia marginata, Goode and Bean, Bull. Mus. Comp. Zoöl., XII, 153.

Body, slender, lanceolate in form, its greatest height contained 4½ times in the extreme length. Scales, moderate, strongly and sharply denticulate, the surface ornamented with many lines and striations, which are so arranged as to form a semblance of median furrows; 88 to 90 scales in a longitudinal series, 34 in a transverse series.

Jaws and snout covered with scales.

Length of the head contained 5½ times in total length. Length of the snout in that of head 4½ times, and equal to diameter of upper eye.

Eyes, moderate, close together, the upper very slightly in advance. Nostril, in a long, slender tube, nearly midway between lower eye and tip of snout.

Mouth, moderate, oblique, curved, its posterior angle beneath the anterior margin of the pupil of the upper eye; its length of gape in that of head 4¼ times, and 5 times in greatest height of body. Dentition feeble.

The dorsal fin begins at a point over the posterior margin of the upper pupil. It is composed of 96 to 100 rays, those about the middle of the body the longest, and contained about 2¼ times in the height of the body.

The anal origin is separated from the snout by a distance equal to 4 times the length of the snout. It has 86–87 rays, and its height is slightly less than that of the dorsal.

The median caudal rays are short, contained 8⅝ times in total length.

The distance of the ventral from the snout is contained 5⅞ times in the total length; its distance from the anal 1⅜ times the diameter of the eye; its rays, four in number, the longest contained 2⅝ times in head.

Color in life, reddish gray, much speckled with brown. Belly, bluish gray. Bases and membrane covering fin-rays, dark brown. Dorsal and anal fins very dark on their last tenth. Caudal, pale, in marked contrast with the dark area of dorsal and anal. Tips of dorsal and anal rays, and some of the membrane covering caudal rays, vermilion.

Color in alcohol, uniform grayish brown, lighter below, with a dark brown line marking margin between the body and the base of the vertical fins, with a lighter line or stripe, as wide as eye, inside.

Radial formula: D. 96–100; A. 86–87; V. 4; P. none. Scales, 88 to 90–34.

The species is described from a specimen, 102 millimeters in length, collected by the steamer *Blake*, at station CLXXXI, in 28° 42′ N. lat., 88° 40′ W. lon., at a depth of 321 fathoms; with a specimen from *Albatross* station 2376, in 29° 03′ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms, as a collateral type. The *Blake* also obtained 13 specimens from station XXVII, off St. Vincent, at a depth of 94 fathoms, and the *Fish Hawk* captured a single specimen from station 1154, in 39° 55′ 31″ N. lat., 70° 39′ W. lon., at a depth of 193 fathoms.

APHORISTIA PIGRA, GOODE and BEAN. (Figure 377.)

Aphoristia pigra, GOODE and BEAN, Bull. Mus. Comp. Zool., Cambridge, XII, 154.

It is distinguished by its abbreviated form, and its large, rough, strongly pectinate scales. The extreme length of the type is 98 millimeters.

The body is shorter than in the congeneric Atlantic species; its greatest height is contained 3¼ times in its total length, or three times in total without snout.

The scales are large, very rough, with strong horizontal striæ and strongly denticulated margins, and rather loosely fixed to the skin; about 65 in a horizontal series, 34 in a transverse series. The jaws and snout are covered with small scales. The length of the head is contained 4⅓ in total length. The length of the snout is contained 4½ times in that of the head. The eyes are moderate in size, very close together, with no scales between; the upper is very slightly in advance, and is distant from the dorsal outline a space equal to its own short diameter. The greatest diameter of the eye is contained six times in the length of the head. The mouth is oblique, curved, its posterior angle directly beneath the middle of the lower eye. Length of gape in that of head four times. The teeth are feeble, closely placed, a little stronger on the colored side.

The nostril tubular, a little nearer to the lower eye than to the tip of the snout.

The dorsal fin begins at a point over the middle of the upper eye, and contains about 90 rays to the middle of the base of the caudal. The rays about the middle of the fin are the longest, their height being a little more than ⅓ that of the body. The distance of the anal fin from the snout is contained 3¾ times in total length. The longest anal rays are about the middle of the body; their length is equal to that of the longest in the dorsal. The anal is connate with the caudal, and consists of 69–75 rays.

The length of the median caudal rays is contained nearly seven times in the total length. The distance of the ventral from the snout is contained 4⅔ times in the total length. It is separated from the anal by a distance equal to the long diameter of the eye. The number of ventral rays is four; the longest ray is 3½ times as long as head.

Color grayish or brownish, with a submetallic lustre upon the scales when examined separately. The denticulations of the scales are dark and prominent, giving a clouded general aspect. Some of the smaller specimens (from station 2318) have a few large irregular brownish blotches above and a dark subcircular blotch near the root of the tail, its diameter twice that of the eye. Colorless below.

Radial formula: D. 90; A. 69–75; V. 4; P. none. L. lat. 65.

The species is described from a specimen obtained by the *Blake* from station XXIII, off St. Kitt's, West Indies, at a depth of 250 fathoms; with specimens obtained by the *Albatross* from station 2318, in 24° 25′ 45″ N. lat., 81° 46′ 45″ W. lon., at a depth of 45 fathoms, and from station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms as collateral types. The *Albatross* also secured examples from station 2425, in 36° 20′ 24″ N. lat., 74° 46′ 3″ W. lon., at a depth of 119 fathoms; and from station 2374, in 29° 11′ 30″ N. lat., 85° 29′ W. lon., at a depth of 26 fathoms.

APHORISTIA DIOMEDEANA, GOODE and BEAN. (Figure 378.)

Aphoristia diomedeana, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 589.

Scales moderate, somewhat loosely fixed, pectinated; about 85 in a longitudinal, 35 in a transverse, series. Jaws and snout covered with small thin scales.

Length of head contained 5⅔ times in the standard length. Length of snout 5 times in that of head. Eyes moderate, equal, very close together, without intervening scales; the upper eye is *directly above the lower one*, and is distant from the dorsal outline an interval equal to its own least diameter; diameter of eye in length of head 6 times.

Mouth oblique, curved, its angle in the vertical through the front margin of the eyes; length of gape equal to that of snout, and contained 5 times in that of head. Teeth very feeble. Nostrils tubular, nearer to eye than to tip of snout.

Dorsal origin in the vertical through middle of eyes; the fin contains 96 rays, including half of caudal, the length of the longest 3½ times in greatest height of body.

Distance of anal origin from snout 4½ times in total length; the anal contains 79 rays, and its greatest height is equal to that of the dorsal.

Length of median caudal rays contained 10 times in total length.

Distance of ventral origin from snout 6 times in total length; the ventral is separated from the anal by a distance equal to one-third the length of head; its length is contained 2⅔ times in that of head; it consists of 4 rays.

Color uniform gray, lighter below, the scales above somewhat metallic in luster. The last fourth of the dorsal has three oblong black blotches somewhat larger than the eye; the anal with four similarly placed. In the young there is a slight brownish marginal line upon each scale, and an appearance of indistinct cloudings of brown upon the colored side.

Radial formula: D. 96; A. 79; V. 4; scales 85-35.

The species is described from a specimen obtained by the *Albatross* from station 2414, (lat. 25° 04′ 30″ N., lon. 82° 59′ 15″ W.; depth, 26 fathoms). Its length is 140 millimeters to base of caudal. The body is somewhat slender, its greatest height (43 millimeters) contained 3¼ times in its length without caudal.

Specimens were also taken by the *Albatross* from station 2362, in 22° 08′ 30″ N. lat., 86° 53′ 30″ W. lon., at a depth of 25 fathoms; from stations 2121, 2122, between 10° 37′ 40″ N. lat., 61° 42′ 40″ W. lon., and 10° 37′ N. lat., 61° 44′ 22″ W. lon., at a depth of from 31 to 34 fathoms. The *Blake* also secured examples from station XXIV, off Dominica, and station XXV.

APHORISTIA PUSILLA, GOODE and BEAN. (Figure 379.)

Aphoristia pusilla, GOODE and BEAN, Proc. U. S. Nat. Mus., VIII, 1885, 590.

The body is slender, lanceolate, its greatest height contained 3½ times in its total length. The scales are small, strongly and sharply denticulated, 85 to 90 in a longitudinal and 38 in a transverse series. Jaws and snout entirely covered with scales.

The length of the head is contained 5 times in total length; the length of the snout in that of the head 5½ times, and equals the diameter of the eye.

Eyes small, very closely approximated in the same vertical line. The nostril is tubular, placed midway between the lower eye and the tip of the snout.

Mouth small, oblique, curved, its posterior angle under the anterior margin of the pupil of the lower eye, the length of its gape in that of the head 4⅔ times, in greatest height of body 6⅔ times. Dentition feeble.

The dorsal fin begins in the vertical through the pupils and is composed of 78 rays; its greatest height is contained 2⅔ times in that of body.

The anal is separated from the snout by a distance about equal to the height of the body, and 7½ times the length of the snout. It has 70 rays; its greatest height equals one-third that of body.

The median caudal rays are short, their length contained eleven times in total.

The distance of the ventral from the snout is contained about 4½ times in total length of body; its length equals twice the diameter of the eye. Its distance from the anal equals twice the diameter of the eye.

Color, light brown, with 6 or 7 crossbars of slightly darker hue. Blind side light.

The species is described from a specimen (Cat. No. 28730, U. S. N. M.), 55 millimeters long, taken by the *Fish Hawk* in 40° 07′ 48″ N. lat., 70° 45′ 54″ W. lon., about 80 fathoms, and a specimen (Cat. No. 28778 U. S. N. M.), taken by the same vessel in 40° 01′ N. lat., 69° 56′ W. lon., from off Marthas Vineyard, 170 fathoms.

AMMOPLEUROPS, Günther.

Ammopleurops, GÜNTHER, Cat. Fish. Brit. Mus., II, 1862, 490.

Eyes on the left side; pectorals none; vertical fins confluent. Scales ctenoid, deciduous, of moderate size; one lateral line. Snout short, with the upper portion not produced into a hook; mouth unsymmetrical, rather narrow; teeth minute, on both sides.

AMMOPLEUROPS LACTEUS, (BONAPARTE), GÜNTHER.

Plagusia lactea, BONAPARTE, Fauna Italica, Pesci, Fasc. V, plate.—COSTA, Fauna Napolitana, II, 60, pl. 1.—CANESTRINI, Arch. Zool., I, 43, pl. IV, fig. 3; Pesci d'Italia, 168.

Ammopleurops lacteus, GÜNTHER, Cat. Fish. Brit. Mus., IV, 490.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 192.

Ammopleurops, with body 3¼ and head nearly 4 times in total length (without caudal). Width of interorbital space about one-fourth length of head. Two nostrils in front of lower eye. Lips not fringed.

Radial formula: D. 90; A. 72 (D.+A.+C. 162—178); P. none; V. 4.

Color, rosy white, the white side a little brighter. Vertical fins spotted with brown near base.

The French ships obtained it on the coast of Spain in 60 meters (station V); off Soudan, 250 meters (station LXV); on the Banc d'Arguin, 140-235 meters (stations XCI-XCII); in the Gulf of Gascony, 400 meters (*Travailleur*, 1882, VIII), and off Peñon de Velez in 370-420 meters.

ARELIA, Kaup.

Arelia, KAUP, Wiegmann's Archiv, 1858, 106.—BLEEKER, Enumeratio, 184.—GÜNTHER, Cat. Fish. Brit. Mus., IV, 493 (as subgenus).

Sinistral pleuronectoids, having no pectorals and confluent vertical fins. Scales ctenoid and lateral line triple. Snout hooked and mouth twisted; two nostrils on left side. Teeth dextral, minute.

This, like the related genera or subgenera grouped by Günther under *Cynoglossus*, is strictly East Indian. It is found in deep water in the Bay of Bengal, *Investigator* station 96, 98–102 fathoms, where it is represented by *Cynoglossus Carpenteri*, Alcock. (Journal of Asiatic Society of Bengal, LVIII, II, 287, pl. XVIII, fig. 1; Ann. and Mag. Nat. Hist., 1890, II, 217.) Dr. Alcock is of the opinion that "the general *facies* of this fish is certainly bathybial."

Order CRANIOMI.

Craniomi, GILL, Proc. U. S. Nat. Mus., 1888, 589.

Teleocephali with the scapular arch abnormal, the post-temporal forming an integral part of the cranium and the postero-temporal crowded out of place by the side of the proscapula above or at the edge of the post-temporal. (*Gill.*)

Family TRIGLIDÆ.

Les Triglides, RISSO, Hist. Nat. Eur. Mérid., 1826, IV, 392.

Triglidæ, BONAPARTE, Saggio, etc., 1831; Catalogo Metodico, 1846, 60.—SWAINSON, Hist. Nat. Fish., etc., 1839, II, 179.—KAUP, Wiegmann's Archiv, 1858, 329.—GÜNTHER, Cat. Fish. Brit. Mus., II, 86.—GILL, Arr. Fam. Fish., 1872, 6 (No. 53).—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 731.

Body elongate, usually more or less fusiform. Head externally bony, usually entirely cuirassed with rough, bony plates, some of which are armed with spines; eyes high; mouth terminal or subinferior; premaxillaries protractile; maxillary without supplemental bone, slipping under the preorbital; teeth very small, in bands in the jaws, and usually on the vomer and palatines; gills 4, a large slit behind the fourth; pseudobranchiæ present; gill-rakers various; gill-membranes free or variously attached to the isthmus. Ventral fins thoracic, wide apart, separated by a flat area, I, 4 or I, 5. Spinous dorsal present,

short; soft dorsal similar to the anal, which is without spines; caudal narrow, few-rayed. Pectorals large, with broad base, sometimes divided, with the three lowermost rays detached. Air-bladder present; pyloric cœca usually present, few in number. *Jordan* and *Gilbert.*

KEY TO THE AMERICAN GENERA

(After Jordan and Gilbert.)

I. Pectoral fin with two or three detached appendages below; ventrals I, 5, wide apart.
  T. Body scaly; teeth present; pectoral appendages 3 .... *Triglinæ*
    A. 1 Palatines toothless .... TRIGLA
    B. 2 Palatines with teeth .... PRIONOTUS

TRIGLA, Artedi.

Trigla, ARTEDI, Genera Piscium, 1788, 42.—CUVIER, Règne Animal, ed. I, 1817, II, 301; ed. 2, 1829, II, 158.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 9,—GÜNTHER, Cat. Fish. Brit. Mus., II, 198.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 733.

Head angular, with bony upper surface and sides. Two dorsals, the first much the shorter. Three free filaments at base of pectoral. Villiform teeth on jaws and usually on vomer. Palatines toothless. Pectoral fins moderate; a series of bony, spinous plates along base of dorsal fins, a pair to each ray, forming a shallow groove, in which the fins are received. Caudal usually emarginate. Scales minute. Lateral line usually forking at base of caudal, with branches running to its tip. Branchiostegals, 7. Pseudobranchiæ present.

Three European species of Trigla were found by the French explorers below 100 fathoms.

(1.) *Trigla cuculus*, Linn. (=*Trigla pini*, Bloch), taken in the Gulf of Gascony in 306 meters (*Travailleur* station XVII). It is a well-known inshore form, from the British Islands to the Mediterranean, where, however, it is not especially abundant. There is no satisfactory evidence that it has ever been found in the western Atlantic.

(2.) *Trigla lyra*, Linn., found in the Gulf of Gascony in 411 fathoms (*Travailleur* station VIII).

(3.) *Trigla cavillone*, Lacépède [=*Lepidotrigla aspera* (C. & V.) Günther], taken off Soudan, in 130–355 meters; on the Banc d'Arguin, in 140–175; off Morocco, in 120; off Spain, in 99, and near the Cape Verdes, in 90. For notes on these three species see *Vaillant*, p. 359.

The *Challenger* took *Trigla leptacantha*, Günther, and *Trigla spiloptera*, Günther, off the Ki Islands, in 140 fathoms (station 192).

Trigla hemisticta, Schlegel, has been found below the hundred-fathom line in the Bay of Bengal, about 40 individuals, many of them females with mature ovaries, having been taken at *Investigator* station No. 96. (Alcock, Ann. and Mag. Nat. Hist., 1889, II, 207.)

PRIONOTUS, Lacépède.

Prionotus, Lacépède, Hist. Nat. Poiss., III, 337, 1802 (type, *Trigla evolans*, L.).

Body subfusiform; profile of head descending to the broad, depressed snout, which is much longer than the small eye; eyes close together, high up; surface of head entirely bony, the bones rough with ridges and granulations; scales on head few or none; preopercle with one or two sharp spines at its angle; opercle with a sharp spine; nape with two strong spines; a spine on shoulder girdle. Mouth rather broad; bands of small, almost granular, teeth on jaws, vomer, and palatines; gill-membranes nearly separate, free from isthmus; gill-rakers rather long. Body covered with small, rough scales, which are not keeled; lateral line continuous; scales of breast very small. Dorsal fins distinct, the first of 8 to 10 rather stout spines; anal fin similar to soft dorsal; pectoral fin with the three lower anterior rays thickened, entirely free from each other and from the fin; ventrals I, 5, wide apart, with a flat space between them, the inner rays longest. Pyloric cœca in moderate number; air-bladder generally with lateral muscles and divided into two lateral parts; vertebræ 10 or 11 + 15. (*Jordan* and *Gilbert.*)

PRIONOTUS MILITARIS, GOODE and BEAN, n. s. (Figures 380, 384.)

The type of the description is a specimen measuring 123 millimeters with the caudal. The length without the caudal, which is the standard of comparison, is 95 millimeters. The body is short and stout, its greatest height (30 millimeters) nearly one-third of the standard length; its greatest width at the base of the pectorals (23 millimeters) is nearly one-fourth of the standard length. The least height of the tail (9 millimeters) is equal to the long diameter of the eye. The head is short, the snout abruptly descending and with two rather long diverging spinous processes at its tip. The orbits are much elevated, the spines very large, and the jaws are small. The greatest length of the head, measured horizontally (33 millimeters), is about one-third of the standard length. The distance measured obliquely from the tip of the rostral spine to the edge of the opercular flap (39 millimeters) is two-fifths of the standard length. Nearly all the spines of the head and the exposed edges of the preorbital, mandible, and opercles are minutely serrate. The diverging spines upon the snout are themselves armed along the margin by numerous spinules. The length of the eye (9 millimeters) equals the width of the interorbital area. The snout (14 millimeters) is more than one-third the length of the head. A strong spine on the preopercle, with a secondary spine at its base. The spine on the preopercle is as long as the snout. A stout spine on the operculum, another in the humeral region, another on the nape extending backward to the base of the fourth dorsal spine. Teeth in the jaws and on the vomer and palate very small, in villiform bands. The length of the maxilla (10 millimeters) is a little greater than that of the eye. The length of the mandible (12 millimeters) is a little less than that of the snout—it reaches about to the vertical from the front of the eye. There is a furrow across the nape immediately behind the eyes. Nine developed gill rakers on the anterior arch, besides several rudiments; all of the gill rakers very short. Pseudobranchiæ present. Branchiostegals 7. The distance of the dorsal from the tip of the snout (39 millimeters) is two-fifths of the standard length. The first two spines are very much produced; the length of the first (85 millimeters) is almost equal to the standard length; the length of the second (87 millimeters) is slightly greater than that of the first. The short spine (23 millimeters) is about twice as long as the mandible. When the dorsal spines are fully extended they reach nearly to the tip of the caudal. The anterior margins of the first three spines are minutely serrated, the serrations being in several rows. The longest ray of the soft dorsal (17 millimeters) is about one-half as long as the head. The length of the middle caudal rays (25 millimeters) equals the length of the anal base. The caudal is slightly emarginate. The length of the pectoral (51 millimeters) is a little more than one-half of the standard length. The longest separate ray of the pectoral is about 1½ times as long as the shortest; its length equal to that of the middle caudal rays. The length of the ventral spine (14 millimeters) is one-half the length of the longest ventral ray (28 millimeters). The ventral when extended reaches to the third ray of the anal. The longest anal ray (16 millimeters) is about one-half as long as the head. The scales are very rough; they are in about 7 rows between the origin of the second dorsal and the lateral line, and 19 rows below the lateral line. The lateral line contains about 40 tubes, and the number of rows of scales counted obliquely is about 55.

D. X, 11; A. I, 9; P. 12+3; V. I, 5.

Color in life, rosy; head and pectoral, speckled with dark brown; 6 or 7 small dark blotches on the upper edge of the pectoral. Some specimens have the inner surface of the pectoral dark on its lower half. In one specimen the dark blotches on the pectoral are grouped into four half bands, of which the middle two are very small.

This species is represented by 6 individuals from station 2362 of the steamer *Albatross;*

5 from station 2388, *Albatross;* 2 young examples from *Albatross* station 2404; 1 young from station 2406, and 2 young ones from station 2407.

The types of the description are the specimens from station 2362, N. lat. 22° 08′ 30″, W. lon. 86° 53′ 30″, from 25 fathoms, off Cape Catoche, Yucatan. The other localities are as follows: station 2388, N. lat. 29° 24′ 30″, W. lon. 88° 01′, from 35 fathoms, Gulf of Mexico; station 2404, N. lat. 28° 44′, W. lon. 85° 16′, from 60 fathoms, Gulf of Mexico; station 2406, N. lat. 28° 46′, W. lon. 84° 49′, from 26 fathoms, Gulf of Mexico; station 2407, N. lat. 28° 47′ 30″, W. lon. 84° 37′, from 24 fathoms, Gulf of Mexico.

PRIONOTUS EGRETTA, GOODE and BEAN, n. s. (Figure 381.)

The standard length, which is the total length without the caudal, is 106 millimeters. The body is rather slender, rapidly tapering posteriorly. The greatest height, which is at the ventrals (23 millimeters), is contained 4½ times in the standard length. The least height of the tail (7 millimeters) equals half the length of the intermaxillary. The head is moderately long, its greatest length (40 millimeters) contained 2⅝ times in the standard length. The snout does not-descend so abruptly as in *P. militarius* and is without projections from the front. Its length (17 millimeters) is half the length of the ventral. The width of the interorbital space (6 millimeters) equals half the long diameter of the eye (12 millimeters). The length of the eye is contained 3½ times in that of the head. The spines of the head are moderately strong and are without subsidiary basal spines. The length of the spine at the angle of the preoperculum is nearly equal to that of the opercular spine, and is nearly half the length of the snout. The exposed edges of the bones of the head are minutely serrated, but the teeth at the end of the snout are slightly enlarged. Humeral spine small, nuchal spines not well developed. One or two spines at the front of the supraorbital and two or three at its posterior portion. About 9 developed gill rakers on the anterior arch; the longest of them about 2 millimeters in length. Teeth in villiform bands in the jaws and on the vomer and palate. The vomerine band very narrow. The length of the maxilla (14 millimeters) nearly one-third the length of the head. The length of the mandible (17 millimeters) equals the length of the snout. The mandible reaches nearly to the vertical from the front of the eye. A very slight groove across the nape immediately behind the eyes continued downward by an interspace between the preopercle and opercle. The distance of the dorsal from the tip of the snout (39 millimeters) is about equal to the length of the head. The base of the spinous dorsal (24 millimeters) equals the length of the head without the snout; the first spine is coarsely serrated for the first sixth of its length, and is produced into a filament, which extends beyond the end of the caudal when laid back, making the length of the first spine (117 millimeters) greater than the standard length of the fish; several of the succeeding spines are also weakly serrated on their anterior margin. The length of the second spine (22 millimeters) nearly equal to that of the base of the fin. The last three spines are very small. The first ray of the second dorsal is also serrated on its anterior margin; the rays greatly increase in size posteriorly to the ninth, which is nearly one-half as long as the head. The base of the second dorsal (28 millimeters) is twice as long as the maxilla. The caudal is somewhat emarginate, the length of the middle rays (26 millimeters) a trifle longer than the base of the spinous dorsal. The anal origin is almost directly under that of the second dorsal. The length of the spine (7 millimeters) is about two-thirds that of the first ray. The anal rays increase in length posteriorly, the length of the ninth (14 millimeters) being one-half of the base of the second dorsal. The length of the pectoral (34 millimeters) is less than the length of the head; the fin when extended reaches to the vertical from the fourth ray of the second dorsal. The longest separate ray of the pectoral (28 millimeters) is as long as the base of the second dorsal. The shortest separate ray (20 millimeters) is one-half the length of the head. Ventral when extended reaches to the origin of the anal. The scales are very small, about 9 rows between the origin of the second dorsal and the lateral line, and about 32 rows between the lateral line and the vent. About 60 tubes in the lateral line; nearly 100 oblique rows can be counted between the head and the caudal fin.

D. XI, 11; A. I, 10; P. 12 + 3; V. I, 5.

Color, light brownish-yellow on the back, paler beneath; the fins, except the pectoral and ventral, pale. The pectoral has five dark bands, of which the third extends entirely across the fin.

The type of the description is a single individual 137 millimeters long, taken by the U. S. steamer *Blake*, at station LXIV, off Barbados, at an uncertain depth, somewhere between 100 and 200 fathoms.

PRIONOTUS STEARNSII, JORDAN and SWAIN.

Prionotus Stearnsii, JORDAN and SWAIN, Proc. U. S. Nat. Mus., 1884 (VII), 541.

A *Prionotus* allied to *Prionotus evolans*, having head 2⅔ in length (3⅓ including caudal); depth. 4 (5); D. VIII–12; A. 12. Scales, (transverse series), 77; pores in lateral line about 48. Length, 3⅝ inches.

Body not very slender; narrowed but compressed above, the width of the nape between the occipital spines being about one-fifth the head. Head depressed and long, its upper profile being a little concave before eye, thence slightly convex or almost straight to front of dorsal. Snout 2½ in head, not very broad, rather more than usually rounded anteriorly and scarcely emarginate at tip. Edges of snout without spine and without distinct serræ, the margin merely granular. Surfaces of bones of head comparatively smooth, but roughened with small granules, which are arranged in radiating striæ, much as in *P. evolans*, but more regularly than in that species.

Mouth rather wide, the maxillary reaching to opposite front of the eye, the mandible about to center of eye; maxillary two in head. Bands of palatine teeth narrow.

Eye small, its diameter (in young specimen) 4⅔ in head. A very small cirrus formed of two or three thickish filaments from a common base on upper part of eye; its length little more than half the pupil. Interorbital area of moderate width, rather deeply concave, its least width 6½ in head. Orbital rim not at all elevated, its bones with entire or granulated edges. No trace of spine or groove behind eye. Occipital spines very weak, the outer pair inconspicuous, not reaching nearly to front of dorsal, the inner pair altogether wanting, no trace of them being seen. No spines, ridges, or evident roughness on temporal region. Preopercle with a single small spine, without smaller one at its base. Lower opercular spine small; upper opercular spine reduced to a blunt point. Humeral spine inconspicuous, not extending beyond opercular spine. The head is thus much less completely armed than in any other of our species of *Prionotus*, the only spinous projections present being the occipital, humeral, opercular and preopercular spines, four pairs. These spines may perhaps become more prominent with age. Membranaceous flap of opercle scaly.

Gill rakers long and very slender, about thirteen developed, the length of the longest about half eye.

Scales rather large, those on the nape and breast little reduced in size; about 10 between dorsal and occiput.

Fins all low and small. First dorsal spine rather the highest, its length 2⅓ in head, its anterior margin serrulate. Longest ray of soft dorsal, 2 in head. Caudal, 1⅓ in head. Longest anal ray 2 in head. Pectorals very short (perhaps longer in the adult), reaching only to front of second dorsal, 1¼ in head. Detached rays slender, the uppermost 1⅞ in head. Ventrals, 1⅕ in head.

Color, in spirits, brown, paler below; scales everywhere, with dark punctulations, these forming a darker shade on the lateral line near the middle of the body; the head plain brown. Spinous dorsal dusky posteriorly. Soft dorsal with two dusky longitudinal shades. Caudal blackish at tip. Anal with a black stripe toward the margin. Pectorals black, the detached rays and ventral fins plain whitish.

The type of this species (No. 36943, U. S. N. M.), 3⅝ inches long, in good condition, was taken from the stomach of a Red Snapper, *Lutjanus Blackfordii*, at Pensacola.

The *Blake* secured a specimen at station CCLI, on the Alacran Shoals, Yucatan, at a depth of 35 fathoms.

The *Albatross* obtained specimens from the following localities: Station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms; station 2400, in 28° 41′ N. lat., 86° 07′ W. lon., at a depth of 169 fathoms; and station 2388, in 29° 24′ 30″ N. lat., 88° 01′ W. lon., at a depth of 35 fathoms.

PRIONOTUS ALATUS, GOODE and BEAN. (Figure 382.)

Prionotus alatus, GOODE and BEAN, Bull. Mus. Comp. Zoöl., x, 1883, 210.

A *Prionotus* with the body normal in form, rather robust; its greatest height equal to one-fourth its length without caudal, and nearly equal to one-fifth of the total length; its greatest width one-fifth of its greatest length without caudal; the least height of tail contained 12 times, or nearly so, in the standard body length, and 3 times in the height of the body.

Scales small and much pectinate, there being in the lateral line about one hundred vertical rows of scales, about 50 of which are tube-bearing and specialized. The number of rows, counting diagonally around the body from the origin of the anal, is 21 below and 7 above the lateral line. The length of the head to the tip of the preopercular spine is contained 2½ times in the standard body length, and very little more than 3 times in the total length. The width of the head is equal to its height. The upper limb of the orbit encroaches upon the upper profile of the head, and the center of the pupil is equidistant from the tip of the snout and the tip of the prolonged preopercular spine. The length of the snout measured obliquely from the anterior margin of the orbit, is equal to that of the postorbital portion of the head to the end of the opercular spine. At the lower angle of the preoperculum is a robust spine, curving slightly upwards, the length of which is equal to that of the first dorsal ray. This spine is serrated upon its outer edge, and has a small spine at its base, which is also serrated. The tip of the spine extends to the perpendicular from the center of the interspace between the third and fourth dorsal spines; while that of the humeral spine extends to the perpendicular from the interspace between the fourth and fifth, and that of the opercular to the perpendicular from the center of the base of the third. There is a strong scapular spine, which extends back to the posterior edge of the second dorsal spine.

The length of the upper jaw is equal to one-third that of the head. The palatine teeth are in short feeble bands, hardly perceptible even with a strong magnifying glass. Gill rakers, 6 in number, besides several rudimentary ones, 5 being below the angle, and the longest equal in length to one-third the diameter of the eye.

The first dorsal fin is inserted above the tip of the upper opercular spine, and at a distance from the snout equal to twice the length of the fourth dorsal spine. The height of the first dorsal spine, which is equal to that of the third, and slightly less than that of the second, equals half the length of the head. Its anterior margin is strongly serrated, while those of the second and third spines are less markedly so. The length of base of first dorsal equals the greatest height of body; the distance between its insertion and that of the second dorsal fin is equal to the length of the longest and superior detached pectoral ray. The second dorsal fin is inserted in the perpendicular over the interspace between the second and third anal rays; the length of its longest ray equals twice the least height of tail, and the length of its base equals the greatest length of the ventral rays. Its first ray is conspicuously serrated on its anterior edge.

The insertion of the anal fin is in the perpendicular below the end of the first dorsal fin: the length of its longest ray is equal to half that of the middle caudal rays.

The caudal is truncated, very slightly emarginate.

The pectoral is very peculiar in structure, its longest ray, the ninth, reaching to the base of the caudal rays, and equal in length to four times that of the fourth dorsal spine. The tenth ray is a little bit shorter, extending nearly to the end of the soft dorsal. The eleventh, twelfth, and thirteenth rays are graduated, decreasing in regular proportion, the thirteenth being less than one fourth as long as the tenth. The eighth is about midway between the tenth and eleventh; the first is slightly longer than the twelfth and those intermediate between the first and the eighth are graduated in length, so as to form a rounded outline for the anterior, or upper, portion of the fin. The pectoral appendages are slender, the third being slightly greater in length than the thirteenth ray, being two-thirds as long as the first, while the second is intermediate between the other two.

The ventral is inserted directly under the base of the pectoral appendages; its first spine about equal in length to the preopercular spine from the base of the supplemental spines; its longest, the third and fourth, exactly equal in length to the base of the second dorsal.

Radial formula: D. x, 12; A. 11; C. 3—7+5—4; P. 13+3; V. I, 5.

L. lat. about 100. Tube-bearing scales, about 50.

Color, brownish above, with about four indistinct transverse band-like blotches, one of which is on the base of the caudal; whitish beneath. Vertical fins uniform, the tips of the caudal rays blackish, with two indistinct cloud-like bands in advance of the terminal bands thus formed. A black blotch, with whitish anterior margin on the membrane between the fourth and fifth dorsal spines; a very inconspicuous blackish spot on the membrane between the fifth and sixth; others still less conspicuous on the succeeding interspaces. The pectoral blotched and clouded with blackish brown and white.

A single specimen of this species of *Prionotus* was obtained off Charleston, S. C., in the same haul with the pleuronectoid described above under the name *Notosema dilecta.* This species belongs to the group referred by Jordan to the subgenus *Ornichthys* of Swainson.

A single specimen of this species was secured by the *Blake* at station CCCXIII, in 32° 31′ 50″ N. lat., 78° 45′ W. lon., at a depth of 75 fathoms.

Specimens were obtained by the *Albatross* from the following localities: Station 2403, in 28° 42′ 30″ N. lat., 85° 29′ W. lon., at a depth of 88 fathoms; station 2404, in 28° 44′ N. lat. 85° 16′ W. lon., at a depth of 60 fathoms; station 2313, in 32° 53′ N. lat., 77° 53′ W. lon., at a depth of 99 fathoms; and station 2417, in 33° 18′ 30″ N. lat., 77° 07′ W. lon., at a depth of 95 fathoms.

PRIONOTUS PALMIPES, (MITCHILL), STORER.

Trigla palmipes, MITCHILL, Trans. Lit. and Phil. Soc., N. Y., I, 1815, 431.
Prionotus palmipes, STORER, Fishes of Mass.—JORDAN & GILBERT, Bull. XVI, U. S. N. M., p. 735.

A *Prionotus* with head comparatively smooth above. Preopercular spine strong; opercle scaleless; band of palatine teeth short and broad, shorter than eye. Pectorals short, not reaching middle of second dorsal, 2⅓ in length; pectoral appendages strong, more or less dilated at their tips; ventrals long, reaching anal; gill rakers rather short, about 10 below angle; maxillary 3⅓ in head. Head, 3; depth, 5.

Radial formula: D. x, 13; A. 12; Lat. l. 58.

Color, brownish above, clouded with darker; throat and branchiostegals dark; a distinct black blotch above on membrane between fourth and fifth dorsal spines, this ocellated below; 2 longitudinal light streaks below dorsal blotch; second dorsal with oblique whitish streaks.

This familiar species was obtained at station 2313 of the *Albatross*, N. lat. 32° 53′, W. lon. 77° 53′, at the depth of 99 fathoms.

PRIONOTUS BEANII, GOODE, n. s. (Figure 383.)

A species of *Prionotus* having the greatest height of the body (29 millimeters) nearly one-fourth of the standard length. Its greatest width (27 millimeters) is slightly less than its height. The least height of the tail (8 millimeters) is nearly one-fifth of the length of the head, and is equal to the short diameter of the eye. The head is moderately long, its length (39 millimeters) being one-third of the standard length. The width of the interorbital space on the bone (6 millimeters) is about one-third the length of the snout. There is a furrow behind the eyes which is interrupted on the nape. The snout is produced into two short obtuse serrated points flanked behind on each side by a short but stout compressed spine; behind this on the snout another short spine. A short spine on the cheek bone. Anterior nostril in a tube which is produced posteriorly into a little flap; posterior nostril in a large shorter tube. The preopercular spine, also, has a short spine at its base. Preocular and supraocular spines present. A pair of postocular spines on each side, one in front of the other. A pair of blunt spines on the occiput and another pair on the nape. Length of opercular spine, measured back to the edge of the preopercle, equals the length of the postorbital part of the head. Humeral spine well developed, its length nearly equal to that of the preocular. The maxilla does not reach to the front of the eye, its length (14 millimeters) being equal to the postorbital part of the head. The mandible reaches about to the vertical from the front of the eye; its length (18 millimeters) nearly one-half the length of the head. Teeth in narrow villiform bands in the jaws and on the vomer and palate. Eight developed gill rakers on the anterior arch. The longest about one-third as long as the eye; five rudiments below and two above the developed rakers of the anterior arch; these are mere tubercles scarcely raised above the general surface. The length of the eye (9 millimeters) is one-half the length of the snout and nearly one-fourth the length of the head. The snout (18 millimeters) is equal to twice the length of the eye and equals the length of the mandible. The distance of the dorsal from the tip of the snout (42 millimeters) is a little greater than the length of the head. The length of the base of the spinous dorsal (26 millimeters) nearly three times the length ot the eye. The first spine is serrated on its anterior margin for the greater portion of its height; it is nearly as long as the second, its length (16 millimeters) is two-fifths the length of the head; the third spine is the longest, its length (20 millimeters) is one-half the length of the head. The last two spines are very small. The third spine, also, is serrated along its anterior margin for the greater portion of its height. There is a very slight interspace between the two dorsals. The length of the first ray of the soft dorsal (16 millimeters) equals that of the second spine of the dorsal; the length of the last ray (13 millimeters) equals one-half of the length of the spinous dorsal base. The length of the middle caudal rays (27 millimeters) equals three times the length of the eye. The caudal is slightly emarginate. The origin of the anal is immediately under the origin of the soft dorsal. The length of the anal base (32 millimeters) is one-half the distance of the anal from the tip of the snout. The spine is only about two-thirds as long as the first ray; its length (7 millimeters) is one-half the length of the maxilla. The length of the longest anal ray (12 millimeters) is one half the length of the spinous dorsal base. The ventral extends to the origin of the anal; its length (33 millimeters) equal to the anal base. The pectoral when extended reaches to the line connecting the fifth ray of the dorsal with the sixth ray of the anal. This fin is emarginate behind; its longest ray is slightly longer than the head and more than twice as long as the longest dorsal spine.

Radial formula: D. x, 12; A. i, 10; P. 13 + 3; V. i, 5.

The type of the description is a specimen 112 millimeters long to base of caudal. Its catalogue number is 39318, from station 2120, steamer *Albatross*, N. lat., 11° 07′ W. lon., 62° 14′ 30″, from 73 fathoms, off Trinidad.

Seven rows of scales between the lateral line and origin of the second dorsal; 19 rows between lateral line and origin of anal; 50 pores in the lateral line, and about 93 oblique rows of scales can be counted. Scales on the breast conspicuously smaller than the others.

Colors of the alcoholic specimen, light yellowish brown above, lighter below. The spinous dorsal has a black blotch between the fourth and fifth spines, its length about two-thirds that of the eye. The membrane connecting the spines of the dorsal with faint dusky shades in several places. Membrane connecting the last three or four rays of the second dorsal slightly dusky. The pectoral with two broad dark areas, separated and surrounded by lighter. The dark markings on the pectoral do not take the form of bands, and have their greatest length nearly parallel with the axis of the fish.

Family PERISTEDIIDÆ.

Peristediinæ, JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 731.
Peristediidæ, GILL, Proc. U. S. Nat. Mus., XI, 1888, 590.

Trigloids, closely allied to *Triglidæ*, from which they are distinguished by having the body mailed instead of scaly, by the absence of teeth, and the separation of the operculum and suboperculum from the interoperculum; and the lesser number of pectoral appendages, which are two rather than three.

PERISTEDION. LACÉPÈDE.

Peristedion, LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 368.

Body elongate, fusiform, covered with bony plates, each of which is armed with a strong spine; head bony; each preorbital produced into a long flat process, which projects more or less beyond the mouth; mouth small; teeth none; lower jaw included, provided with barbels; gill membranes separate, narrowly joined to the isthmus anteriorly; gill rakers slender. Dorsal fin continuous or divided. Pectoral fin short, with the two lowermost rays detached. Ventrals I, 5, separated by a broad flat area. Air-bladder simple. Pyloric cæca about 10. Warm seas. Color, generally red.

In addition to the Atlantic species named below the *Challenger* took *P. molluccense*, Blkr., off the Ki Islands (station 192), 140 fathoms; *P. Murrayi*, Günther, from the Sea of Banda, 200 fathoms; and *P. liorhynchum*, from the Admiralty Island, 152 fathoms.

PERISTEDION MINIATUM, GOODE. (Figures 385, 385 A, B.)

Peristedium miniatum, GOODE, Proc. U. S. Nat. Mus., III, 1880, 349, 480.—GOODE and BEAN, Bull. Mus. Comp. Zoöl., X, 1883, 212.—JORDAN and GILBERT, Bull., XVI, U. S. Nat. Mus., 732.—GÜNTHER, Challenger Report, XXII, 64.

The greatest width of the body (20) is equal to its greatest height (19.5) being one-fifth of its total length without caudal. The general armature of the body is much like that described by Günther under *Peristethus brevirostre*.[1] The number of plates between the gill openings and the base of the tail is from 27 to 29. There are 4 series of spiny plates on each side, the spines of the abdominal series becoming very weak and obsolete towards the tip of the tail.

The length of the head (40.15) is two-fifths of the total length without caudal. The length of the preorbital processes (7) is contained about 3½ times in the distance from their extremities to the anterior margin of the orbit. The interorbital space is deeply concave; its width (6.75) contained between 6 and 7 times in the length of the head. Protuberance on the forehead *very* slight. The length of the snout (22.5) is more than half that of the head (in young less). The diameter of the eye (65) is contained between 6 and 7 times in the length of the head. There is one pair of spines upon the upper surface of the snout behind the base of the preorbital processes, and another larger pair upon the preorbital processes, one upon each. The ridge of the preoperculum terminates in a depressed short, sharp-pointed spine. The number of small tentacles upon either side of the lower jaw is about 10, the smallest nearest to the symphysis. The long tentacles at the angles of the mouth are fringed, and extend to the base of the pectorals. In other respects Günther's description of *P. brevirostre* is ample for this species.

Color, bright crimson.

Radial formula: D. VII, 18; A. 17; C. 16; P. 2 + 10; V. 6. L. lat., 27 on one side, 28 on the other

Three other specimens had the following: D. VIII, 18; A. 17. D. VII, 18; A. 18. D. VII, 18; A. 18.

Total length of type (No. 26023) 300 millimeters.

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[1] Cat. Fish. Brit. Mus., II, 1860, p. 218.

Young specimens of this species were secured by the *Blake* from station CCCXXVII, in 34° 00′ 30″ N. lat., 76° 10′ 30″ W. lon., at a depth of 178 fathoms; and from station CCCXIV, in 32° 24′ N. lat., 78° 44′ W. lon., at a depth of 142 fathoms.

The *Fish Hawk* obtained specimens as follows: No. 29055, U. S. N. M., from station 1046, in 38° 33′ N. lat., 73° 18′ W. lon., at a depth of 104 fathoms; No. 29058, U. S. N. M., from station 1047, in 38° 31′ N. lat., 73° 21′ W. long., at a depth of 156 fathoms; No. 28789, U. S. N. M., from station 940, in 39° 54′ N. lat., 69° 51′ 30″ W. lon., at a depth of 93 fathoms; No. 26023, U. S. N. M., from station 869, in 40° 02′ 18″ N. lat., 70° 23′ 06″ W. lon., at a depth of 192 fathoms; No. 26030, from station 871, in 40° 02′ 54″ N. lat., 70° 23′ 40 W. lon., at a depth of 115 fathoms.

The *Albatross* obtained specimens from station 2264, in 37° 07′ 50″ N. lat., 74° 34′ 20″ W. lon., at a depth of 167 fathoms; station 2425, in 36° 20′ 24 N. lat., 74° 46′ 30″ W. lon., at a depth of 119 fathoms; and station 2426, in 36° 01′ 30″ N. lat., 74° 47′ 30″ W. lon., at a depth of 93 fathoms.

TABLE OF MEASUREMENTS.

Current number of specimen Locality	26,023. 869.		26,030, 871 (young).	
	Milli-meters.	100ths of length	Milli-meters.	100ths of length.
Extreme length	300		53	
Length to end of middle caudal rays	272	100	45	100
Body:				
Greatest height at origin of dorsal		19.50		19
Greatest width under pectorals		20		15
Height at ventrals		19.50		18
Least height of tail		2.75		3
Head:				
Greatest length		40.50		39
Distance from snout to nape		32.75		36
Greatest width		29		30
Width of interorbital area		6.75		12
Length of snout		22.50		18
Length of operculum		10		7
Length of maxillary		12		14.50
Length of mandible		12.50		13
Distance from snout to orbit		21		19
Diameter of orbit, longitudinal		6.50		10
Width of mouth opening		12		13
End of frontal spine to symphysis of maxillaries		7		6
Length of barbels		29		10
Dorsal (spinous):				
Distance from snout		38.25		40
Length of base		53.50		53.50
Greatest height, second spine		10.75		10.75
Height at first spine		10		10
Height at last spine		3		6
Width of upper surface of occipital plate		7		12.50
Length of upper surface of occipital plate		4.75		8
Width of upper surface of nuchal plate		6.50		6.25
Length of upper surface of nuchal plate		5		3
Anal:				
Distance from snout		53.50		51
Length of base		36		40
Height at first spine		3.50		3
Height at second spine		6.50		7
Height at third spine		8		8
Height at last spine		4		4
Caudal:				
Length of midde rays		9.50		14
Length of external rays		5		
Pectoral:				
Distance from snout		33		34
Length		18.25		14
Ventral:				
Distance from snout		31		30
Distance from symphysis of mandibles		37.25		40
Length		17.50		20
Isthmus		15.50		15
Dorsal		VII, 18		VII, 18
Anal		18		18
Caudal		16		
Pectoral		2+10		
Ventral		6		
Number of plates in lateral line		28		
From anterior edge of frontal plate to end of frontal spine		9.50		8

PERISTEDION LONGISPATHA, GOODE and BEAN. (Figure 386.)

Peristedium longispatha, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, No. 5, 166.

Body high anteriorly, its greatest height (39 millimeters) contained 4½ times in total length. The length of the head, without prolongations, is contained 2½ times in the total length; with prolongations, 2 times. The crown of the head is flat, separated from the nuchal plate by a deep furrow, which is convex forward. The interorbital space is deeply concave, the supraorbital margins being swollen; its width (16 millimeters) equal to the long diameter of the orbit. No protuberance on the forehead, which is much depressed, its outline descending abruptly and rapidly in front of the eyes. A ridge, but no spine, beneath the eye. The length of the snout (49 millimeters), including the preorbital extension, is more than half the length of the head; the preorbital extension equals about half the length of the snout. The processes are flat, rounded anteriorly, and covered with minute granulations; they diverge considerably, the distance of the tips apart (36 millimeters), being nearly twice that at their bases (19 millimeters). A ridge arises at the base of the preorbital process and extends to the angle of the preoperculum, and its width at the angle (8 millimeters) is contained twice in the diameter of the orbit. A narrow inconspicuous and interrupted ridge below. A ridge on the operculum, ending in a sharp spine at the angle; its length is equal to the diameter of the eye.

The jaws are feeble, toothless; the lower jaw with 2 long, much fringed barbels and 14 shorter ones. The length of the long barbels (32 millimeters), twice the diameter of the eye.

The maxilla does not quite reach the vertical through the anterior margin of the eye. The diameter of the eye (16 millimeters) is contained 4 times in the length of the head without its prolongations. The greatest width of the head over the preopercular ridge (61 millimeters) is contained three times in the total length.

The dorsal origin is directly in a line with the upper angle of the gill opening. The longest spine (18 millimeters), slightly longer than the width of interorbital space. The fin has 8+19 rays.

The anal origin is under that of the second dorsal. The fin has 19 rays. Caudal small, slightly emarginate; the length of its middle rays (23 millimeters) equals 1½ times the diameter of the eye.

Ventrals slightly in advance of the pectorals and extending farther back, reaching slightly beyond vent and to vertical through seventh row of scales.

Pectoral short, extending to vertical from fifth scale of the lateral line, the longest detached ray to the sixth. Twenty-nine rows of scales.

Color in life, bright roseate; a black blotch near the tip of the pectoral. Dorsal with narrow dark margin; tip of caudal black.

The elongation of the preorbital extension is noticeable in the smallest examples.

This form was taken by the *Blake*, at stations LVIII, off Havana, 242 fathoms (type); LXII, off Barbados 209 fathoms; LXIII, off Barbados, 209 fathoms; and by the *Albatross*, at stations in the Gulf of Mexico as follows: 2397, 280 fathoms; 2376, 324 fathoms; 2358, 222 fathoms.

PERISTEDION IMBERBE, POEY.

Peristedion imberbe, POEY, Rep. Fis. Nat. Cuba, II, 1866, 158; 1868, 462; Mem. Hist. Nat. Cuba, II, 367, 389.
Peristedion micronemus, POEY, Ann. Lyc. Nat. Hist. New York, IX, 321.
Peristethus micronema, GÜNTHER, Challenger Report, XXII, 1887, 65.

Body somewhat slender, its greatest height contained 4½ times in the distance between the tip of the snout and the base of the caudal. Length of head, without prolongations, contained 2½ times in total length; with prolongations, twice. Crown of the head flat; interorbital space concave, with a depressed groove in its middle, branching posteriorly along the base of the supraorbital crests; its width somewhat greater than the horizontal diameter of the orbit. No protuberances on the forehead or on the snout above, and no ridges or spines beneath the eye. The length of the snout, including the preorbital extension, is equal to the length of the head; the preorbital extension about two-fifths of the length of the snout. The preorbital processes are flat, unarmed, and somewhat divergent; a ridge arises at the base of the preorbital process and extends to the angle of the preoperculum, where it terminates in a blunt spine; a low ridge on the operculum, ending in a rather inconspicuous spine; another above, and close to it, pointing upward. The length of the opercular ridge of spines is nearly equal to the horizontal diameter of the eye.

Jaws feeble and apparently toothless; barbels on the lower jaw so inconspicuous at present as to be scarcely visible.

The maxillary extends almost to the vertical through the anterior margin of the eye; the diameter of the eye is contained 4 times in the length of the head without its prolongations.

The dorsal origin is over the tip of the opercular spine; the origin of the anal apparently behind that of the second dorsal; ventrals slightly in advance of the pectorals, and not so far back, though their tips reach somewhat beyond the vent; pectorals rather long; about twenty-five rows of scales.

The type, about 2 inches in length, is in the Museum of Comparative Zoölogy at Cambridge, and has been studied in the preparation of this description, but the example being unique and very small, we have not ventured to examine it so closely as would have been practicable with more material. It is, however, apparently a well marked species, resembling in a general way *P. longispatha*. It was obtained by Poey from the stomach of *Polymixia nobilis*, taken near Cuba in deep water.

PERISTEDION GRACILE, GOODE and BEAN, n. s. (Figure 387).

Body very slender; its greatest height (18 millimeters) is nearly one-sixth of its length. The length of the head to the tip of the prolongated rostral spine is 48 millimeters; without the prolongations its length is 36 millimeters or twice the greatest height of the body. The interorbital space is deeply concave. The interorbital width (10 millimeters) equals one-half the length of the snout including the rostral spine. The forehead descends gently towards the snout and the supraorbital crests are very little elevated. The rostral spine on each side is continued backward by a slight bony ridge ending in a blunt spine at the angle of the preoperculum. The opercular spine is small, the length of the operculum with the spine being about equal to the length of the eye. The length of the snout with preorbital extension (29 millimeters) is a little more than one-fourth of the standard length; the length of the spine alone (13 millimeters) is nearly equal to the length of the mandible. The jaws are feeble and toothless. The length of the maxilla (12 millimeters) is one fourth the length of the head. The length of the mandible (15 millimeters) is one half the length of the snout with the preorbital extension. The mandible has two groups of barbels, one on each side of its lower edge. The length of the longest barbel (9 millimeters) equals that of the eye. The barbels are subdivided into several fringes; the number of barbels on each side of the mandible may be divided up into 8 or 9 clusters. The mandible extends to the vertical through the front of the eye. Twenty six gill-rakers on the first arch, the longest one-half as long as the eye. The longitudinal diameter of the eye (9 millimeters) is nearly equal to the width of the interorbital space. Greatest width of the head over the preorbital ridge (15 millimeters) is one-half the length of the snout including the preorbital extension. The spinous dorsal originates directly above the end of the opercular flap; the first spine is slightly the longest, its length (15 millimeters) equals the length of the snout and its projecting spine; it also equals the short diameter of the eye. The longest ray of the second dorsal (11 millimeters) is nearly one-fourth the length of the head. The least height of the tail (3 millimeters) is one-third the length of the eye. The anal origin is under the second ray of the soft dorsal; the fin extends as far back as the dorsal, the length of its base (41 millimeters) being 4 times the width of the interorbital area, the rays about as long as those of the second dorsal. The length of the middle caudal rays (12 millimeters) is four-thirds the length of the eye, the fin being emarginate. The ventral base is under the pectoral base, the fin reaching to the vent, its length (18 millimeters) twice that of the eye. The pectoral is short, reaching to below the eighth scute of the lateral line; the longest detached ray reaches to below the ninth scute of the lateral line; its length (24 millimeters) equals one-half the length of the head. Thirty scutes in the lateral line.

Radial formula: B. 7–8; D. VIII, 20; A. I, 18; P. 11+2; V. I, 5.

Color (of alcoholic specimen) very light yellow, a broad pearly band along the sides, back stippled with light brownish; pectorals with dark mottlings.

The type of the species is a specimen 5 inches long, taken at station 2401, steamer *Albatross*, N. lat. 28° 38′ 30,″ W. lon. 85° 52′ 30″, from 142 fathoms. This locality is in the Gulf of Mexico.

PERISTEDION PLATYCEPHALUM, GOODE and BEAN. (Figure 388, A, B.)

Peristedium platycephalum, GOODE and BEAN, Bull. Mus. Comp. Zoöl., XII, No. 5. p. 167.

A *Peristedion* with body much depressed, its greatest height (23 millimeters), 6⅛ in body length, 6¾ in total.

Length of head without prolongations (47 millimeters), twice the height of body, 3½ in its length; with prolongations, 2½ in body length. Interorbital space deeply concave, the supraorbital margin being swollen, its width (14 millimeters) equal to the long diameter of the eye. No protuberance on the forehead, which is much depressed, its outline descending abruptly and rapidly in front of the eyes. A ridge below the eye, not armed; a small vertical spine behind each nostril. Stout spines upon operculum and several upon the vertex. The length of snout with its extensions (29 millimeters) is half the length of the head, its processes (10 millimeters) about 3 in its own length. The processes are flat, triangular, diverging slightly, the distance apart of their tips 2–2½ that at their bases. A ridge extends backwards from the base of each process along the lower edge of the preoperculum, ending behind in a sharp, flat spine; the greatest width of the expanded portion, on the preoperculum, only one-fourth as wide as the eye. Beneath this is another less conspicuous ridge with minutely serrated edge, which is double in front and single behind, the two portions separated by a slight notch.

Jaws normal, the two tentacles much fringed, their length (16 millimeters) not much exceeding the diameter of the eye; between them, and placed about equidistant from each other, are two bunches of short tentacles, about 4 in each. Chin with numerous short tentacles, some of them as long as the eye, arranged for the most part in bunches of 4. The maxilla does not reach to the anterior margin of orbit. Diameter of eye (13 millimeters) nearly 4 in greatest length of head, and exactly half total length of snout. Greatest width of head, over the preopercular ridges (43 millime ters), nearly equal to its own length without the processes.

Dorsal origin over the upper angle of gill-opening. The length of the longest spine (18 millimeters) is equal to that of postorbital portion of head.

Anal origin slightly behind origin of second dorsal and vertical through seventh lateral scute.

Caudal small, slightly emarginate, with tips slightly produced, the length of the middle rays (18 millimeters) equal to that of the dorsal.

Ventral origin in advance of the axil of the pectorals; the fin extends slightly beyond the vent, but not quite to the origin of the anal; its length (35 millimeters) about twice the length of the dorsal.

Pectoral rather long, extending to the ninth scute of the lateral line and past the vertical through the origin of the anal.

Radial formula: D. VIII, 17; A. I, 17; V. I, 5; L. lat. 29.

Color, red; body and fins mottled and blotched with darker.

Types from *Blake*, stations LX, off Barbados, 123 fathoms; LIX, off Barbados, 288 fathoms.

PERISTEDION TRUNCATUM, GÜNTHER.

Peristethus truncatum, GÜNTHER, Challenger Report I, Part 6, 1880, 7, pl. II, fig. A.

The length of the preorbital processes is contained twice and three-fourths in the distance between their extremities and the anterior margin of the orbit. Interorbital space deeply concave, with a depressed smooth groove along the middle; a minute spine on the base of each preorbital process, but no other on the upper surface of the snout; lower jaw with enormous barbels, the longest being fringed. The preopercular ridge does not extend beyond the hind margin of the bone, and is not produced into a spine; also the opercular ridge terminates in a short and truncated projection. Each scute of the body with a hooked spine. Each of the bony plates between the ventral fins is not quite twice as long as broad. Rose-colored, with small, irregular brownish spots on the upper parts.

Radial formula: D. VII, 19; A. 20; L. lat. 32.

The type of this species, a specimen 6⅓ inches long, was taken by the *Challenger* at station 122, off the coast of Pernambuco, in 30 or 350 fathoms or in some intermediate depth.

Dr. Günther, though, unwilling to commit himself as to the bathybial habitat of any of the forms collected by the *Challenger* at station 122, preferring to include them all in his report upon the shore-fishes, has nevertheless described one of the fishes there taken, under the very significant name of *Bathyanthias*.

Suborder TÆNIOSOMI.

Tæniosomi, GILL, American Naturalist, XXI, 1887, 86; XXIV, 1890, 481.

Teleocephals with the scapular arch subnormal, post-temporal undivided and closely applied to the back of the cranium, between the epiotic and pterotic, or upon the parietal; hypercoracoid perforate at or near the margin; cranium with the epiotics enlarged, encroaching backward and juxtaposed behind, intervening between the exoccipitals and supraoccipatal; prootic and the opisthotic represented chiefly by the enlarged prootic; suborbital chain imperfect; the scapular bones separated by intervening cartilaginous elements; the hypopharyngeals styliform and parallel with the branchial arches; epipharyngeals in full number (4 pairs), and mostly compressed; the dorsal fin composed of inarticulate rays or spines, separable into lateral halves, and the ventrals (when present) sub brachial.

A myodome may be present or absent, none being developed in the Regalecidæ, but one being distinct and supplemented by a dichost in the Trachypteridæ. (*Gill.*)

"The ribbon fishes," says Günther, "are true deep sea fishes, met with in all parts of the oceans, generally found when floating dead on the surface, or thrown ashore by the waves. Their body is like a band, specimens of from 15 to 20 feet long being from 10 to 12 inches deep and about an inch or two broad at their thickest part. The eye is large and lateral; the mouth small, armed with very feeble teeth; the head deep and short. A high dorsal fin runs along the whole length of the back, and is supported by extremely numerous rays; its foremost portion, on the head, is detached from the rest of the fin, and composed of very elongate flexible spines. The anal fin is absent. The caudal fin (if preserved, which is rarely the case, in adult specimens) has an extra-axial position, being directed upwards like a fan. The ventrals are thoracic, either composed of several rays or reduced to a single long filament. The coloration is generally silvery, with rosy fins.

"When these fishes reach the surface of the water the expansion of the gases within their bodies has so loosened all the parts of their muscular and bony system that they can be lifted out of the water with difficulty only, and nearly always portions of the body and fins are broken and lost. The bones contain very little bony matter, are very porous, thin, and light. At what depth ribbon fishes live is not known; probably the depths vary for different species; but although none have been yet obtained by means of the deep-sea dredge, they must be abundant at the bottom of all oceans, as dead fishes or fragments of them are frequently obtained. Some writers have supposed from the great length and narrow shape of these fishes that they have been mistaken for 'sea serpents,' but as these monsters of the sea are always represented by those who have had the good fortune of meeting with them as remarkably active, it is not likely that harmless ribbon fishes, which are either dying or dead, have been the objects described as 'sea serpents.'"

KEY TO THE FAMILIES.

I. Ventrals well developed or absent .... TRACHYPTERIDÆ
II. Ventrals reduced to a single long filament .... REGALECIDÆ

Family TRACHYPTERIDÆ.

Trachypteridæ, SWAINSON, Nat. Hist. Fish., 1839, 47.—GILL, American Naturalist, XXIV, 1890, 482.

Tæniosomes with the body moderately elongated and very compressed, the head short, the opercular apparatus abbreviated (the operculum extended downwards, the suboperculum below it, and the interoperculum contracted backwards and bounded behind by the operculum and suboperculum), ventrals pauciradiate in young, atrophied or lost in adult, the cranium with a myodome and dichost, the supraoccipital continued behind into a prominence, the epiotics confined to the sides and back of the cranium, and without ribs.

The ribbon-fishes are well known in the Eastern Atlantic and the Mediterranean, and have even been found as far west as Madeira. *Trachypterus* has never been found in the Western Atlantic. Some few representatives have been found on the west coast of South America, and one or two examples have been taken in New Zealand. They are generally admitted to be true deep-sea fishes, which live at very great depths, and are only found when floating dead on the surface or washed ashore by the waves. Almost nothing is known of their habits except through Nilsson's observations in the far north. This naturalist, as well as Olafsen, appears to have had the opportunity of observing them in life. They say that they approach the shore at flood tide on sandy shelving bottoms, and are often left by the retreating waves. Nilsson's opinion is that their habits resemble those of the "flat-fishes," and that they move with one side turned obliquely upward, the other toward the ground; and he says that they have been seen on the bottom in 2 or 3 fathoms of water, where the fishermen hook them up with the implements employed to raise dead seals, and that they are slow swimmers. This is not necessarily the case, however, for the removal of pressure and the rough treatment by which they were probably washed upon the shore would be demoralizing, to say the least. *Trichiurus lepturus*, a fish very similar in form, is a very strong, swift swimmer.

Whether or not the habits of *Trachypterus arcticus*, on which these observations were made, are a safe guide in regard to the other forms is a matter of some doubt, but it is certain that they live far from the surface, except near the Arctic Circle, and that they only come ashore accidentally. They have never been taken by the deep-sea dredge or trawl-net, and indeed perfect specimens are very rare, the bodies being very soft and brittle, the bones and fin rays exceedingly fragile.

A considerable number of species have been described, but these are, in most instances, based upon one or two specimens. It is probable that future studies may be as fruitful as that of Emery, who, by means of a series of 23 specimens, succeeded in uniting at least three of the Mediterranean species, which for half a century or more had been regarded as distinct. As has been remarked, not a single individual of *Trachypterus* has ever been found in the Western Atlantic, although the common species of the Eastern Atlantic, *T. atlanticus*, is not unusually taken, one or more specimens, according to Günther, being secured along the coast of Northern Europe after almost every severe gale. We have deemed it desirable to include in this paper partial diagnoses and references to the literature concerning each of the species at present recognized in the Atlantic Basin, in order that American naturalists may have at hand a convenient means of identifying material which is almost certain, sooner or later, to fall into their hands.

We desire to quote the recommendation of Dr. Günther, and to strongly urge upon anyone who may be so fortunate as to secure one of these fishes that no attempt should be made to keep it entire, but that it should be cut into short lengths and preserved in the strongest spirits, each piece wrapped separately in muslin.

Günther (Challenger Report, XXII, 72) gives a very satisfactory summary of the present state of knowledge in regard to the variations of *Trachypterus* at different periods of growth.

TRACHYPTERUS, Gouan.

Trachypterus, GOUAN, Hist. Poiss., 104, 153.—CUVIER, Règne Animal, ed. 2, 1829, II, 245.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., X, 313.—GÜNTHER, Cat. Fish. Brit. Mus., III, 300; Challenger Report, XXII, 72.
Bogmarus, SCHNEIDER, Bloch, Syst. Ichth., 1801, 518.

Trachypterids having the body elongate, compressed, riband-shaped, the dorsal fin extending the entire length of the back. Anal absent; each ventral well developed, if present, but sometimes absent. Caudal present and placed for the most part above the longitudinal axis of the body. No air bladder. Pyloric appendages numerous.

The ventrals appear to be absent in some individuals, but Day calls attention to the fact that most of the specimens of *T. arcticus* taken along the coast of Great Britain have had no ventrals. In the very young, as has been shown by Emery, the fin rays commence to grow when it is about 6 millimeters long, and continue to lengthen until it is about 24 millimeters long, after which a partial shortening takes place. The ventrals are very elongate in the young, and the caudal rays much longer than in the grown fish.

Young individuals (from 2 to 4 inches) are not rarely met with near the surface; they possess the most extraordinary development of fin rays observed in the whole class of fishes, some of them being several times larger than the body, and provided with lappet-like dilatations. There is no doubt that fishes with such delicate appendages are bred and live in depths where the water is absolutely quiet, as a sojourn in the disturbed water of the surface would deprive them at once of organs which must be of some utility for their preservation.

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(Adapted from Moreau.)

I. Lower line of body straight.
  A. Dorsal rays 160.
    1. Dorsal rays smooth.
      a. Height of body 5¼ in length .... T. ARCTICUS
      b. Height of body 8½ in length .... T. RÜPPELII
      c. Height of body 9–10 in length .... T. LIOPTERUS
    2. Dorsal rays rough.
      a. Lateral line spinous.
        * Height of body 4–10 in length .... T. IRIS
      b. Lateral line smooth.
        * Height of body 5¼ in length .... T. GRYPHURUS
II. Lower line of body irregular, sinuous.
  A. Dorsal rays less than 130.
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III. Anterior dorsal and ventral rays much prolonged .... T. REPANDUS

TRACHYPTERUS IRIS, (WALB.), CUV. and VAL. (Figure 391.)

Falx Venetorum, BELON.
Cepola trachyptera, GMELIN, Linn. Syst. Nat., 1788, 1187.
Cepola iris, WALBAUM, Artedi, III, 617.
Trachypterus iris, CUVIER and VALENCIENNES, *op. cit.*, X, 341, pl. CCXCVII.—GÜNTHER, Cat. Fish. Brit. Mus., III, 303.—MOREAU, Hist. Nat. Poiss., France, II, 560.—GIGLIOLI, Elenco, 32.
Trachypterus tænia, SCHNEIDER, Bloch, Syst. Ichth., 1801, 480.—COSTA, Fauna Napolitana, pl. IX.—BONAPARTE, Catalogo Metodico, No. 711.—GÜNTHER, *loc. cit.*—CANESTRINI, Fauna Italica, Pesci., 113.—GIGLIOLI, Elenco, *loc. cit.*
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Gymnetrus cepedianus, RISSO, Ichth. Nice, 1810, 146, pl. V, Fig. 17.—Hist. Nat. Eur. Mérid., III, 1826, 295.
Epidesmus maculatus, RANZANI, Opusc. Sci. d'Italia, II, 133.

Regalecus maculatus, NARDO, Giorn. di Fisica (sec. II), VII, 116, pl. I, fig. 1.
"*Trachypterus Costæ*, COCCO."
Trachypterus Spinolæ, CUVIER and VALENCIENNES, *loc. cit.*, 328, pl. CCXCVI.—BONAPARTE, Catalogo, No. 712.—GÜNTHER, Cat. Fish. Brit. Mus., III, 300.—CANESTRINI, *op. cit.*, 193.
Trachypterus falx, CUVIER and VALENCIENNES, *op. cit.*, X, 333.—COSTA, Fauna Napolitana, Pesci, pl. IX, *bis*.

A *Trachypterus* having the lower line of the body straight; dorsal rays 137–170, these rays being rough; the lateral line spinous; and the height of the body contained from 4 to 10 times in the total length of the fish (excluding the caudal).

Radial formula: D. 4–8+120–170; P. 10.

Color, silvery white, with a few round, black spots or blotches.

Three species, for a long time considered distinct by European ichthyologists, and recognized by them under the names of *T. spinolæ*, *T. tænia* and *T. iris*, have been shown by Emery to be identical, being successive stages of one and the same species. In a very important paper published by him in the "Acts" of the Academy of Lincei, Rome (III, 1879, 390–395, figs. 1–6), and in the "Mittheilungen aus der Zoologischen Station zu Neapel" (1879, 1581) he has given full particulars of his examinations of 23 specimens.

This species is known only from the Mediterranean. The largest individuals under the name of *Trachypterus iris* have been recorded from Nice, Banyul, Sicily, Corsica, Leghorn, and Elba. The specimen discussed by Moreau was 1.5 meters in length. A smaller size, described as *T. spinolæ*, has been identified from Nice, Cette, Elba, Naples, and Sicily. The specimen obtained by Moreau from Cette was 0.95 meter long. A smaller form, as identified by Moreau under the name of *T. falx* (*T. tænia*), has been obtained from Nice, Cette, Messina, and Algiers. Moreau's specimen was 0.52 meter in length.

Among the common names are *Pesce bannera* (Naples), *Flamba* (Cette), *Squaglia sole* (Naples). Rondeletius and Gesner called it *Falx Venetorum*—the Venetian blade.

TRACHYPTERUS GRYPHURUS, LOWE.

Trachypterus gryphurus, LOWE, Proc. Zoöl. Soc., 1850, 248.—GÜNTHER, Cat. Fish. Brit. Mus., III, 301.

Intermediate between *T. tænia* and *T. iris*, approaching perhaps nearest to the latter, but differing in its deeper shape, its depth being two-elevenths of the total length, and in the more backward position of the third dark side spot. The ventral fins are short, only equaling one-twelfth of the body without the caudal fin, and the first four produced rays of the first dorsal are equal in length to the ventral fins. The lateral line ends as in Cuvier and Valenciennes's figure (t. 297) of *T. iris*, but is quite unarmed. The ventral line is serrulate, and the whole surface, particularly towards the ventral line, is finely shagreened or granulate, the granulations becoming stronger toward the ventral line, as in the same figure. In shape and proportions it agrees better with *T. tænia*, but differs in several important particulars from Cuvier and Valenciennes's description of that fish. The only individual examined occurred in June, 1845, and has been added by me to the collection of the Cambridge Philosophical Society. It was scarcely quite dead when I first saw it, and was in the most perfect state of preservation. Another *Trachypterus* had occurred in June, 1844, and was probably the same species; but the example was unfortunately thrown away by the person to whom it had been missent without my seeing it. It was said to have been about 3 feet long. The whole body is pure bright silver, appearing as if frosted, from the fine granulations of the surface. The fins are of a delicate scarlet or vermilion, the lower point or angle of the caudal being tipped, and the hinder end of the dorsal edged, with black. On the sides are 3 blackish oval or elliptic spots. This example was 25 inches long exclusive of the caudal fin, which resembles a bat's or griffon's wing, and is erected in a fanlike manner, the lower lobe or portion being suppressed or undeveloped, and only indicated by the presence of 5 short spinules or abortive rays. (*Lowe.*)

This species is known from a single specimen obtained by Lowe at Madeira in 1849, and is distinguished from *T. trachypterus* chiefly by the fact that its lateral line is smooth, as well as by minor characteristics.

TRACHYPTERUS ARCTICUS, (Brünnich), Nilsson. (Figure 392.)

Gymnogaster arcticus, Brünnich, Nye Sammlung Dansk. Vid. Selsk. Skr., iii, p. 408, pl. B, figs. 1–3.
Gymnetrus arcticus, Jenyns, British Animals.
Trachypterus arcticus, Nilsson, Skand. Fauna, Fisk., 162.—Duguid, Proc. Zoöl. Soc., 1851, 116.—Günther, Cat. Fish. Brit. Mus., iii, 305.—Collett, Norges Fiske, 78; Vid. Selsk. Forh., Christiania, 1879, 1, 59.—Day, Fishes Great Britain and Ireland, i, 216, pl. lxiii.
Bogmarus islandicus, Schneider, Bloch, Systema Ichthyologiæ, 1801, 518, pl. ci.
Trachypterus bogmarus, Cuvier and Valenciennes, Hist. Nat. Poiss., x, 346, *et al.*
Traychypterus vogmarus, Reinhardt, Vid. Selsk. Skr., vii, D. 65, *et al.*

A *Trachypterus* having the dorsal rays smooth, and the height of the body contained 5 times, or a little more, in its length.

An elaborate description taken from specimens studied at Norwich, Newcastle, and Montrose, will be found in Day's Fishes of Great Britain. This species occurs from Iceland to the Orkneys and the shores of the British isles. The largest British example is 7½ feet long, but Day is of the opinion that it grows to a much larger size.

It would seem probable that studies similar to that made by Emery upon the Italian forms will result in uniting with this species also *T. Rüppellii* and *T. liopterus*.

TRACHYPTERUS RÜPPELLII, Günther.

Trachypterus Rüppellii, Günther, Cat. Fish. Brit. Mus., iii, 307.

A *Trachypterus* having height of body contained about 8 times in its total length; smooth dorsal rays and spinous lateral line.

Radial formula: D. 6/135; A. none; C. 8; P. 10.

Color, silvery, a very distinct black spot at the commencement of the second fifth of the total length; another, sometimes present, farther back on the body.

. This species was described by Günther from a specimen 51 inches in length obtained somewhere in the Mediterranean, and now preserved in the British Museum.

TRACHYPTERUS LIOPTERUS, Cuvier and Valenciennes.

? *Bogmarus Aristotelis*, Risso, Hist. Nat. Eur. Mérid., iii, 1829, 297.
Trachypterus liopterus, Cuvier and Valenciennes, Hist. Nat. Poiss., x, 312.—Moreau, Hist. Nat. Poiss., France, ii, 562.—Günther, Cat. Fish. Brit. Mus., iii, 307.

A *Trachypterus* having the height of the body contained from 9 to 10 times in its total length. Smooth dorsal rays. Spiny lateral line.

Radial formula: D. 6–7+169–174; C. 8–6; P. 12; A. none; V. i, 7.

Color, silvery white, with a blackish spot in the first fifth of its length, and sometimes, according to Valenciennes and Günther, a second spot behind it.

This species, according to Günther, closely resembles *T. trachypterus*, but in the smoothness of the dorsal rays is more nearly related to *T. arcticus*.

Specimens have been obtained at Nice, Naples, Toulon, Genoa, and Messina. In the opinion of Giglioli it is very distinct from the other Mediterranean forms.

TRACHYPTERUS CRISTATUS, Bonelli.

Trachypterus cristatus, Bonelli, Mem. Accad. Sci. Turin, xxiv, 1819, 487, pl. ix.—Günther, Cat. Fish. Brit. Mus., iii, 301.—Moreau, Hist. Nat. Poiss. France, ii, 567.
Trachypterus Bonellii, Cuvier and Valenciennes, Hist. Nat. Poiss., x, 331.

A *Trachypterus* characterized by having the lower profile of the trunk much more prominent than that of the tail, which is narrow and slender, and by an unusually small number of rays in the dorsal fin. It has a spiny lateral line.

Color, silvery, with the fins red, and usually two blackish spots on the dorsal crest and five others upon the posterior half of the dorsal.

The type specimen in the museum at Genoa has, according to Günther, much the appearance of a deformed fish. Günther calls attention to the fact that Risso described a similarly grotesquely shaped fish under the name of *Gymnetrus Müllerianus* (Wiegmann's Archiv, 1840, 13), and Moreau, in his Fishes of France (p. 567), devotes three pages to an argument for the specific distinctness of *T. cristatus*.

TRACHYPTERUS REPANDUS, (METAXA), COSTA.

"*Gymnetrus repandus*, METAXA."
Trachypterus repandus, COSTA, Fauna Napolitana, Pesci, pl. IX.

A *Trachypterus* with the greatest height of the body contained about 3½ times in its total length (without caudal). The belly is sharp and rough, the caudal peduncle very slender. The anterior dorsal is composed of 8 rays, the length of which is more than 1½ times the distance between the tip of the snout and the margin of the caudal; these rays have here and there upon them membranous expansions. The ventrals are about as long as the fish, and the first ray at its extremity becomes divided into 4 membranous filaments.

Radial formula: D. 8+152; A. none; P. 10; V. 7; C. 10.

Color: The entire body is silvery, with numerous bluish-black dots, which, being placed more closely together in the region of the back, form interrupted transverse bands; these in the caudal region completely surround the body. There are certain reddish spots which mingle with the blue ones, giving a rosy tint to the spots upon the back. The fins are rosy; only the membranous expansions of the anterior dorsal are black. The caudal is of the same color, except the upper and lower margins, which are somewhat clouded.

This form has been taken at Civita Vecchia and Naples, and has been seen also in the Adriatic. A figure of it is given in Günther's article "Ichthyology" in the Cyclopædia Britannica, and also in the Study of Fishes (p. 521). It is undoubtedly a young of some other form, but possibly not of *T. trachypterus*, since the small form described by Costa under the name *T. filicauda* has been identified by Emery with that species. *T. filicauda* has a very long filament at the tip of the next to the last caudal ray, counting from above. Its dorsal crest is very long, but lacks the membranous expansion noted in *T. repandus*. The ventrals are also very long.

Family REGALECIDÆ.

I Ginnetridi, RAFINESQUE, Indice d'Ittiologia Siciliana, 1810, 31.
Gymnetridæ, SWAINSON, Nat. Hist. Fishes, 1839, II, 47, 49.
Regalecidæ, GILL, Standard Nat. Hist., III 1885; American Naturalist, XXI, 1887, 86; XXIV, 1890, 482.

Tæniosomes with the body very elongated and compressed, the head oblong, the opercular apparatus well developed (the operculum extended backwards, the suboperculum obliquely behind it, and the interoperculum extended upwards below the two), the preorbital chain oblique and widest at the second bone, ventrals represented by single elongate rays, the cranium with the myodome atrophied and the dichost suppressed, the supraoccipital pushed forward by the extensive development of the epiotics which encroach forwards on the roof as well as back and sides of the cranium, and with short ribs. (*Gill.*)

REGALECUS, Brünnich.

Regalecus, BRÜNNICH, Nya Sammlung, III, 1788, 414.—GÜNTHER, Cat. Fish. Brit. Mus., III, 307; Challenger Report, XXII, 73.
Gymnetrus, SCHNEIDER, Bloch Syst. Ichth., 1801, 487.—CUVIER and VALENCIENNES, Hist. Nat. Poiss, X, 352.

Body very elongate, compressed. Head oblong. Teeth absent. Ventrals each a prolonged filament, sometimes with a dilated tip. Caudal rudimentary (not so in *R. Russelii*, from Asia). No air bladder. Pyloric appendages in considerable numbers.

REGALECUS GLESNE, ASCANIUS. (Figure 395.)

Spada marina, IMPERATO.
Ophidium glesne, ASCANIUS, Nya Samml. Vid. Selsk. Skr. III, 419.
Regalecus glesne, ASCANIUS, Icones Rerum Naturalium, 1806, pl. XI.—LACÉPÈDE, op. cit., II, 214.—GRAY, Proc. Zool. Soc., 1849, 81.—GÜNTHER, Cat. Fish. Brit. Mus., III, 310.
Gymnetrus glesne, CUVIER and VALENCIENNES, op. cit., X, 366.

Regalecus remipes, **Brünnich**, *loc. cit.*, 1788, 414, pl. B, figs. 4-5.
Gymnetrus remipes, **Schneider**, *loc. cit.*, 482, pl. 88.
Gymnetrus Grillii, **Lindroph**, K. Vet. Ak. Hand., 1798, 291, pl. VIII.—**Schneider**, *op. cit.*, 482.
Regalecus Grillii, **Günther**, *op. cit.*, 311.
Cepola gladius, **Walbaum**, Artedi, III, 617.
Gymnetrus gladius, **Cuvier** and **Valenciennes**, Hist. Nat. Poiss., X, 325, pl. CCXCVIII.
Regalecus gladius, **Günther**, Cat. Fish. Brit. Mus., III, 308.—**Canestrini**, Fauna Italica, Pesci, 195.—**Moreau** *loc. cit.*, 555.—**Giglioli**, Elenco, 32.
Gymnetrus Hawkenii, **Bloch**, Ichth., XII, 1792, 88, 425.—**Lacépède**, Hist. Nat. Poiss., III, 380.—**Shaw**, Zool., IV, 197.
Gymnetrus Hawkinsii, **Schneider**, Bloch Syst. Ichth., 1801, 197.
Gymnetrus Ascanii, **Shaw**, Zool., IV, 197.
Gymnetrus longeradiatus, **Risso**, Hist. Nat., III, 1826, 296.
Gymnetrus telum, **Cuvier** and **Valenciennes**, *op. cit.*, X, 361, pl. CCXCIX.
Regalecus telum, **Moreau**, Hist. Nat. Poiss. France, 557.—**Giglioli**, *loc. cit.*
Regalecus Banksii, **Cuvier** and **Valenciennes**, *op. cit.*, X, 365.—**Day**, Fishes Great Britain and Ireland, I, 220, pl. LXIV.
Gymnetrus Banksii, **Tristram**, Proc. Zool. Soc., 1866, 147.
Gymnetrus capensis, **Cuvier** and **Valenciennes**, *op. cit.*, X, 376.—**Günther**, *loc. cit.*—**Layard**, Proc. Zool. Soc., 1868, 319 (figure).

Body very elongate, its height from one-twelfth to one twenty-fourth of its length. Length of the head contained from 16 to 20 times in the length of the body. Snout short, truncated; cleft of mouth vertical, the upper jaw very protractile. Jaws minute or absent. Diameter of eye 4 to 6 times in length of head. The anterior rays, 8 to 15 in number, form an elevated crest, sometimes in two parts, the posterior rays of this crest with membranous tips. Each ventral ray with a lobate membranous tip. Skin with numerous bony tubercles. Lateral line placed low.

Radial formula: D. 275-400; P. 11-14; V. I.

Color, silver gray, with a few spots or streaks of darker hue, most numerous anteriorly.

It is not certain that there is more than one species of *Regalecus*, although, as the synonymy which precedes clearly shows, various names have been suggested in connection with the comparatively few individuals which, during the past century and a half, have been captured in the North Atlantic. There appears to be considerable possibility of individual variation in proportions of height to length, and in the number of rays in the dorsal fin, but it is a fact well known to ichthyologists that constancy is not to be expected in forms in which the number of vertebræ and fin rays has been extended far beyond the normal average.

It should also be said that most of the individuals studied have been in very imperfect condition, and also that in many instances the observations have been made by untrained observers, so that it seems doubtful whether there is really more than one species to be assigned to the Atlantic fauna. At all events, Günther, Collett, Lütken, and Day agree in the idea that it is impossible to discriminate between the forms already described, and we follow their lead in considering them all, for the present, as a single species. It is not impossible, of course, that, should better material be obtained, it may be desirable to separate the group into more subspecies, but until this shall be done discrimination leads to confusion rather than to definite knowledge.

The fishes belonging to the genus *Regalecus* are very remarkable, not only on account of their peculiar appearance and structure, but because of their enormous size. They have been known to attain the length of 20 feet, and it is more than probable that they grow very much longer, and that many of the creatures popularly identified with the "sea serpent" are only large individuals of this type. Indeed, it seems quite safe to assign to this group all the so-called "sea serpents" which have been described as swimming rapidly near the surface, with a horse-like head raised above the water, surmounted by a mane-like crest of red or brown.

The individual which came ashore at Hungry Bay in Bermuda in 1860, and which was about 17 feet long, was described by the people who saw it before its capture as being very much larger, and as having a head of an immense horse with a flaming red mane. Günther (Challenger Report, XXII, 73–76) has in the most painstaking manner brought together a list of the specimens taken in the North Atlantic, as far as they are known to science. He mentions 14 known upon the Scandinavian coasts from 1740 to 1852; 19 on the British coasts from 1759 to 1884; 1 in the Mediterranean (he states, however, that about half a dozen specimens have been observed in the Mediterranean); 1 in the Bermudas; 3 at the Cape of Good Hope; 1 in the Indian Ocean, and 5 off the coast of New Zealand.

He calls attention to the fact that of those observed on the British and Scandinavian coasts 4 were observed in the month of January, 5 in February, 8 in March, 2 in April, 1 in May, 1 in June, 1 in July, 2 in August, 1 in September, and 1 in October. He also calls attention to the fact that by far the greater proportion of their capture, in the Northern Hemisphere, at least, is in the stormy season.

This agrees with what we know of the capture of *Trachypterus*, which likewise seems to be brought to the surface only by great commotions of the ocean.

The popular name of *Regalecus* is "oar-fish," in allusion to the blade-like expansion of the extremities of the two ventral fins. *Regalecus* is also called in the books the "king of the herrings." Strangely enough, no representative of this genus has been found along the coast of North America, except once at the Bermudas.

Günther is of the opinion that the distribution of this fish in the depths of the sea is the same as that of *Trachypterus*. The similarity in their geographical distribution is quite remarkable.

Family STYLOPHORIDÆ.

(Ordinal relations doubtful.)

Stylephoridæ, SWAINSON, Nat. Hist. Fishes, 1839, II, 47.

STYLEPHORUS, Shaw.

Stylephorus, SHAW, Trans. Linn. Soc. London, I, 1791, 90, plate.

Ribband-shaped fish, having the body elongate, and compressed; the dorsals extending from the head nearly to the end of the tail; the tail terminating in an exceedingly long, cord-like appendage, about twice as long as the head. Anal absent. Ventrals absent. Caudal erected upwards, having its rays connected by a rather firm membrane. Snout produced; mouth small, toothless; maxillary bones small, short, hidden behind intermaxillaries. Mandible long, extending far behind the eye. Eyes large, turned forward; suborbital very large, covering nearly the whole of the cheek and extending backward behind the eye. Opercles small. Gill openings wide; gills 4. Vent premedian. Branchiostegals 4.

STYLEPHORUS CHORDATUS, SHAW. (Figures 393, 394.)

Stylephorus chordatus, SHAW, *loc. cit.*; Zoölogist, IV, 87; Naturalists' Miscellany, VIII, pl. CCLXXIV.—BLAINVILLE, Journ. Phys., LXXXVII, 60 pl. I, fig. 1.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., X, 381.—GÜNTHER, Cat. Fish. Brit. Mus., III, 306.

Height of body one-fifth of total length (without caudal); length of head one-sixth. Eyes large, close together. Pectorals pointed, erected upwards, about half as long as head. Dorsal extending nearly to the end of the tail.

Radial formula: D. 110; C. 6; P. 13.

This remarkable form is known from only a single specimen, 11 inches long, with the caudal appendage 22 inches in length, which was taken in the Atlantic, between Cuba and Martinique, about the year 1790, and is now in the British Museum. It is undoubtedly an inhabitant of great depths.

Order HEMIBRANCHII.

Hemibranchii, Cope, Proc. Amer. Assoc. Adv. Science, xx, 1872, 338.—Gill, Arr. Fam. Fish., 872, xxxix; Proc. Acad. Nat. Sci., Phila., 1884, 154.

Physoclystous, teleocephalous fishes, having the pharyngeal bones and branchial arches in some respects reduced or deficient, and only one bone connecting the shoulder girdle with the skull.

Family MACRORHAMPHOSIDÆ.

I Centrischini, Rafinesque, Indice d' Ittiologia Siciliana, 1810, 33–34.
Centriscoidei, Bleeker, Enum. Sp. Piscium, Archipel. Indico, 1859, xxiii.
Centriscidæ, Swainson, Nat. Hist. Fish, etc., 1839, ii, 31.—Günther, Cat. Fish Brit. Mus., iii, 1861, 518.—Gill, Arr. Fam. Fishes, 1872, 25.—Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 1882, 387.
Macrorhamphosidæ, Gill, Proc. Acad. Nat. Sci., Phila., 1884, 163; Century Dictionary, 3565.

Hemibranchiates with compressed body, armed with bony plates on belly and anterior parts of body. Snout long, tubiform. Ventrals abdominal, with one spine and seven rays. Dorsal spinous, distinct, median or post median. The four anterior vertebræ much lengthened. The branchihyals and pharyngeals mostly present, the fourth superior branchihyal and the first and fourth superior pharyngeal wanting.

MACRORHAMPHOSUS, Lacépède.

Macrorhamphosus, Lacépède, Hist. Nat. Poiss., v, 136.
Centriscus, Cuvier, Règne Animal, ed. i, 1817, ii, 350.—Günther, Cat. Fish Brit. Mus., iii, 518.—Jordan and Gilbert, Proc. U. S. Nat. Mus., v, 1883, 575.
Orthichthys, Gill, Proc. Acad. Nat. Sci., Phila., 1862, 231.

Centriscids, having the body oblong, slowly merging into a caudal peduncle. Back straight; dorsal spines about 7. Three longitudinal rows of plates on the breast.

MACRORHAMPHOSUS SCOLOPAX, (Linnæus). (Figure 396).

Centriscus scolopax, Linnæus, Syst. Nat., ed. xii, 1766, i, 415.—Günther, *loc. cit.*—Vaillant, Exp. Sci. Travailleur et Talisman, 338, pl. xxvii, Fig. 3.

A *Macrorhamphosus*, with very strong second dorsal spine, which is serrated posteriorly, whose length is three-fifths to three-eighths of the distance from the opercle to the caudal; the height of its body is four-sevenths to three-fifths of the distance from the operculum to the base of the caudal. Lateral line 57; transverse line 37.

Radial formula: D. v+12; A. 20.

Color, rose or reddish olive on the back, silvery on the sides and on the belly.

This species is not unusual in the Mediterranean, has been found on the south coast of England, and in Massachusetts Bay. As many as 10 individuals were caught by the French exploring vessels at considerable depths:—off the coast of Morocco, station xxiii, at 120 meters; off that of Soudan, station lxvii, at 130 meters; and on the Banc d'Arguin, stations xc, xci, and xcii, at 140 to 235 meters.

Family AULOSTOMIDÆ.

Les Aulostomides (part) Latreille, Fam. Nat. Règne Animal, 1825, 19.
Aulostomatidæ (part) Cantor, Cat. Malayan Fishes, 1850, 211.
Aulostomatoidei, Bleeker, Enum. Sp. Pisc. Arch. Ind., 1859, xxiii.
Aulostomidæ, Gill, Arr. Fam. Fish., 1872, 14; Proc. Acad. Nat. Sci., Phila., 1884, 160.

Hemibranchiate fishes, with compressed, elongate body, small ctenoid scales, and continuous lateral line. Head long; mouth small; with snout elongate, compressed, tubiform; lower jaw prominent, with barbel at symphysis. Premaxillary not protractile; maxillary broad, triangular, with a supplemental bone. Teeth minute, in bands on lower jaw and vomer. Spinous dorsal present, of 8 to 12 feeble, isolated spines. Soft dorsal and anal elongate, similar posteriorly. Caudal rhombic, without filiform rays. Ventrals subabdominal, composed of 6 articulated rays. First four vertebræ elongated. Gill membranes separate, free from the isthmus.

AULOSTOMA, Lacépède.

Aulostoma, Lacépède, Hist. Nat. Poiss., v, 1803, 537.—Günther, Cat. Fish. Brit. Mus., iii, 535.—Jordan and Gilbert, Bull. xvi, U. S. Nat. Mus., 390.—Gill, Proc. Acad. Nat. Sci., Phila., 1884, 161.
Polypterichthys, Bleeker, Naturk. Tijdschr. Nederlandsch-Indie, iv, 608.

Aulostomids with body much compressed, teeth rudimentary, and with 8 to 12 dorsal spines. The dorsal and anal oblong, opposite and similar; each with from 23 to 28 rays. Caudal cuneiform.

AULOSTOMA LONGIPES, Vaillant. (Figure 397.)

Aulostoma longipes, Vaillant, Exp. Sci. Travailleur et Talisman, 340, pl. xxvii, fig. 4.

This species is described by Vaillant from a very small specimen, five millimeters in length, in a bad state of preservation from off Morocco in 1,163 meters. It is referred by him provisionally to the genus *Aulostoma*, and the figure would seem to indicate that his identification is correct. It may possibly be found to be a young of *A. coloratum*.

Body elongate, nearly cylindrical; its height about one-ninth, its thickness one-eleventh of its length. Length of the head a little more than one-third of total length; snout contained two and one-fourth times in the length of the head. Diameter of the eye apparently about one-eighth of the length of the head; the interorbital space almost nothing. No trace of scales is visible upon the specimen, and the lateral line is only indicated by a series of pigmentary spots.

In the place of the dorsal, Vaillant found only a very short fin, placed far back; and an anal exactly similar to it in shape and size. The caudal was mutilated, but appeared to Vaillant to have had no prolonged median rays. Pectorals moderately long. Ventrals composed (as nearly as it is possible to determine) of 6 rays, inserted far back and extending to the base of the caudal, which is long, being more than one-third of the entire length of the body.

Radial formula: D. 5; A. 9+; V. 6.

As Vaillant indicates, the only obstacle in the way of considering this the young of *A. coloratum* is the position and length of the ventrals, and the fact that *A. coloratum* has not been found in the eastern Atlantic.

Order PEDICULATI.

Carpal bones notably elongate, forming a sort of arm, which supports the broad pectorals. Gill openings reduced to a large or small foramen, situated in or near the axils, more or less posterior to the pectorals. No scales. Ventral fins jugular, if present; first vertebra united to the cranium by a suture; epiotics united behind supra-occipital; elongate basal pectoral radii reduced in number; no interclavicles; post-temporal broad, flat, simple; superior pharyngeals two, similar, spatulate, with anterior stem and transverse blade; basis of cranium simple. No air duct to the swim bladder. Anterior dorsal reduced to a few tentacle-like, mostly isolated, spines. (*Jordan* and *Gilbert*.)

ANALYSIS OF FAMILIES OF PEDICULATI.

I. Gill openings in, behind, or below the lower axils of the pectorals; mouth large, terminal.
  A. Pseudobranchiæ present; pseudobrachia with two actinosts; head broad, depressed....... Lophiidæ
  B. Pseudobranchiæ none; pseudobrachia with three actinosts.
    1. Ventral fins developed; pectoral members geniculated, with elongate pseudobrachia .... Antennariidæ
    2. Ventral fins obsolete; pectoral members not geniculate, with moderate pseudobrachia. Ceratiidæ
II. Gill openings in or behind the upper axils; mouth small, usually inferior............. Onchocephalidæ

Family LOPHIIDÆ.

I Lofidi, Rafinesque, Indice d'Ittiologia Siciliana, 1810, 42.
Lophiidæ, Swainson, Nat. Hist. Fish., 1839, II, 195.
Lophiidæ, Bonaparte, Catalogo Metodico, 1846–70.
Lophiidæ, Gill, Proc. Acad. Nat. Sci. Phila., 1863, 89; Arr. Families of Fishes, 1872, 2.—Jordan & Gilbert, Bull. XVI, U. S. N. M., 844 (full description).
Lophioidei, Bleeker, Tentamen, 1859, XVI.

Head wide, depressed, very large. Body contracted, conical, tapering rapidly backward from the shoulders. Mouth exceedingly large, terminal, opening into an enormous stomach; upper jaw protractile; maxillary without supplementary bone; lower jaw projecting; both jaws with very strong, unequal, cardiform teeth, some of the teeth caninelike, most of them depressible; vomer and palatines usually with strong teeth. Gill openings comparatively large, in the lower axil of the pectorals. Pseudobranchiæ present. Gill rakers none. Skin mostly smooth, naked, with many dermal flaps about the head. Spinous dorsal of 3 isolated tentacle-like spines on the head and 3 smaller ones behind, which form a continuous fin; second dorsal moderate, similar to the anal; pectoral members scarcely geniculated, each with two actinosts and with elongate pseudobrachia; ventrals jugular, I, 5, widely separated. Pyloric cœca present. (*Jordan* and *Gilbert*.)

The family *Lophiidæ* has two genera, *Lophius* and *Lophiomus*, Gill. The latter is distinguished by the diminished number of vertebræ (about 19), and has for its type *Lophiomus setigerus*, (Wahl), Gill, from the coasts of China and Japan.[1]

LOPHIUS, Artedi.

Lophius, Artedi, Genera Piscium, 62.—Linnæus, Syst. Nat., ed. X, 1756, I, 236—Cuvier, Règne Animal, ed. I, 1817, 308.—Günther, Cat Fish, Brit. Mus., II, 178.
Lophiopsis, Guichenot.

Lophiid fishes, with head large, subcircular in front, cranial portion somewhat elevated, lower jaw much projecting. Jaws with stout cardiform teeth in 2 or 3 alternate series: vomer dentigerous.

Branchiæ 3, the first branchial arch without lamellæ.

Anterior cephalic spine elongated, tentacular, with fleshy tip. Ventral fins very large, winglike in young, decreasing with maturity, but always large.

Body naked, head always spinigerous, especially in the young, and with strong composite spines at angles of cephalic disc.

Vertebræ in considerable number (27–31). Lophius has three species: *L. piscatorius*, described below, and *L. budegassa*, Spinola, confined to the Mediterranean, and distinguished from all other Lophiids by its shorter second dorsal and its simple lanceolate humeral spine, and *Lophius Naresii*, Günther, found at a depth of 150 fathoms north of New Guinea, 115 fathoms, Philippines, and at the Admiralty Islands.

The Mediterranean *L. budegassa*, Spinola, and the form from the China Sea, *Lophiomus setigerus*, will doubtless also be found to have an abyssal range, since they, like the Atlantic form, are well adapted to life at great depths.

LOPHIUS PISCATORIUS, Linnæus. (Figures 100, 100 A, B.)

Lophius piscatorius, Linnæus, Systema Naturæ, ed. X, 1758, I, p. 236.—Gill, Proc. U. S. N. M., I, 1878, 219 (selected synonymy, 1758–1872).—Goode, Proc. U. S. N. M., III, p. 469.—Günther, Challenger Report, XXII, 49.—Vaillant, Exp. Sci. Travailleur et Talisman, 1888, 348.
Lophius americanus, Storer., Hist. Fish. Mass., 1867, 101, pl. XVIII, fig. 2.

This well-known form, which is found throughout the North Atlantic Basin and on the east ranges south to the Cape of Good Hope, needs no description here, except the very brief diagnosis, given by Gill as follows: A *Lophius* with a tridentate humeral spine, 11–12 rays in the dorsal fin, and the mouth behind the hyoid bone immaculate. It occurs on the west coast of Scandinavia north to latitude 69°–71°, and in America as far north as

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[1] Gill, Proc. U. S. Nat. Mus., I, p. 552.

Newfoundland. The museum of the Essex Institute has a specimen about 4 inches in length, taken on the Banks of Newfoundland in 1856, by L. J. Johnson. This is probably the most northern recorded occurrence of the species in the western Atlantic, except an unconfirmed statement by Pennant of its appearance in Hudson's Bay.

It frequents the moderate depths along the coast from Nova Scotia to Virginia and at greater depth as far south as the Antilles. The *Blake* obtained it off Barbados at a depth of 209 fathoms (station IV), and at 84 fathoms in latitude 23° 13′, longitude 89° 10′ (station CCLVII).

The *Fish Hawk* trawled it at station 826. Another specimen (No. 26170), 26 centimeters long, containing immature ova, was taken at station 894, at a depth of 365 fathoms; also a large specimen with immature ova (No. 26098), from station 876, 120 fathoms; and a smaller one, perhaps two years old (No. 26070), from station 878, 142½ fathoms.

The *Albatross* obtained young individuals at station 2025 and station 2421.

Günther has admitted it to the list of abyssal forms on the authority of the observations of American naturalists. It has since been announced that the *Talisman* obtained it at 400 to 760 meters (stations CX, CXI, CXIII *a*, CXXIII) about the Azores and Cape Verdes.

Family ANTENNARIIDÆ.

Antennariidæ, GILL, Proc. Acad. Nat. Sci., Phila., 1863, p. 89.—Arrangement, Families of Fishes, 2 (No. 131); Proc. U. S. N. M., I, 1878, pp. 215, 223.—JORDAN & GILBERT, Bull. XVI, U. S. N. M., 845.

Pediculates with head and body more or less compressed. Mouth opening upwards, vertical or very oblique; jaws with cardiform teeth. Gill openings in or behind the lower axils of the pectorals small and porelike. No pseudobranchiæ. Skin naked, smooth, or prickly. Pectoral members distinctly geniculated. Pseudobrachia long, with 3 actinosts. Ventral fins well developed, jugular, approximated. Spinous dorsal of 1 to 3 separated tentacle-like spines; soft dorsal, larger than anal. Pyloric cœca none.

PTEROPHRYNE, Gill.

Pterophryne, GILL, Proc. Acad. Nat. Sci. Phila., XV, 1863, 90; Proc. U. S. Nat. Mus., I, 1878, 216.
Pterophrynoides, GILL, Proc. U. S. Nat. Mus., I, 1878, 216 (name proposed as an alternate for *Pterophryne*, if the latter is too near to *Pterophrynus*).

Antennariids with skin naked and smooth; caudal peduncle free; mouth oblique; dorsal spines completely exserted; soft dorsal and anal expanded vertically; pectorals and wrists slender, and ventrals elongated.

PTEROPHRYNE HISTRIO, (LINNÆUS), GILL.

Lophius histrio, LINNÆUS Syst. Nat., ed. XII, 1766, I, 493.
Pterophryne histrio, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 90; Proc. U. S. Nat. Mus., I, 1878, 216 (with full synonymy).
Antennarius marmoratus.—GÜNTHER, Cat. Fish. Brit. Mus., III, 187.

A description of this species in its protean manifestations of form and color seems scarcely necessary here, since its characters are well known to every tyro in ichthyology.

The specimens before us are all apparently of the type referred to by GÜNTHER under the variety E. (Cat. Fish. Brit. Mus., III, p. 187), the *Antennarius marmoratus* of Cuvier and Valenciennes.

A specimen was obtained by the U. S. Coast Survey steamer *Blake* off St. Vincent, in the West Indies (station III), at a depth of 464 fathoms, and another by the U. S. Fish Commission steamer *Albatross*, at the surface, near station 2108. There is, of course, no positive evidence that the *Blake's* specimen actually came from the bottom.

ANTENNARIUS, Cuvier.

Antennarius, CUVIER, Règne Animal, ed. I, 1817, II, 310 (wrongly credited to Commerson, who was not binomial).—GÜNTHER, Cat. Fish. Brit. Mus., III, 183.—GILL, Proc. Acad. Nat. Sci., Phila., XV, 1863, 90.
Cheironectes, CUVIER, Règne Animal, ed. 2, 1829, II, 252, note (Preoccupied in Mammalogy, Illiger, 1811).

Antennariids having body covered with spines generally forked; caudal peduncle free; mouth moderate, oblique; pectorals and wrists widened; ventrals short; anal oblong.

ANTENNARIUS PLEUROPHTHALMUS, GILL.

Antennqrius pleurophthalmus, GILL., Proc. Acad. Nat. Sci. Phila., 1863, 92: Proc. U. S. Nat. Mus., v, 1883, 556.—JORDAN and GILBERT, Bull., XVI, U. S. N. M., 816.

"The anterior dorsal equals about a third of the length of the caudal fin and has at its end a laciniated or fringed lobe extending upward; the second is moderate, slightly curved, and rather longer than the first, and with a membrane extending nearly to the base of the third spine; the latter is free, extends backward nearly to the fin, and almost connected with it by the membrane. The skin is covered with minute bifurcated spines.

"The color is brown, marbled with lighter, especially before and behind the dorsals and above the pectorals; distant black dots are also scattered over the body. Three large ocelli or black spots, margined with light brown, are on each side: one at the middle of the basal half of the dorsal, a second below, intermediate between it and the anus, and a third in the middle of the caudal fin. The floor of the mouth behind the tongue is black, with whitish-yellow radiating lines, while the tongue itself is light brown, with darker radiating bands or spots." (*Gill.*)

This species is probably pelagic and not abyssal.

Specimens were obtained by the *Blake* from station CCXLII, in 23° 13′ N. lat., 89° 10′ W. lon., at a depth of 84 fathoms, and from station CCXXVII, in 24° 34′ N. lat., 83° 16′ W. lon., at a depth of 36 fathoms. Also by the *Albatross* from station 2404, in 28° 44′ N. lat., 85° 16′ W. lon., at a depth of 60 fathoms; from station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms; and from station 2318, in 24° 25′ 45″ N. lat., 81° 46′ 45″ W. lon., at a depth of 45 fathoms.

CHAUNAX, Lowe.

Chaunax, LOWE, Trans. Zoöl. Soc., London, III, 1846, 339.—GÜNTHER, Cat. Fish. Brit. Mus., III, 200.—GILL, Proc. U. S. Nat. Mus., I, 1878, 222.

Antennariids with head very large, depressed, cuboid; mouth cleft, wide, subvertical. Jaws and palate with bands of small teeth. Spinous dorsal represented by a small rostral tentacle receivable into groove behind it. Soft dorsal moderate, low. Anal short. Ventrals present. Branchiæ 2½. Pseudobranchiæ absent.

CHAUNAX PICTUS, LOWE. (Figure 398.)

Chaunax pictus, LOWE, Trans. Zoöl. Soc. Lond., III, 1846. 339, Pl. LI (specimen from off Madeira).—GÜNTHER, Cat. Fish. Brit. Mus., III, 1861, 200.—GILL, Proc. Acad. Nat. Sci., Phila., 1863, 90 (generic diagnosis in synopsis of family); Proc. U. S. Nat. Mus., I, 1878, 222.—GOODE, Proc. U. S. Nat. Mus., III, 170.—JORDAN and GILBERT, Bull. 16, U. S. Nat. Mus., 846.—GÜNTHER, Challenger Report, XXII, 1887, 58, Pl. X, Fig. A.—VAILLANT, Exp. Sci. Travailleur et Talisman, 1888, 343, Pl. XXVIII, Figs. I-II.—ALCOCK, Ann. and Mag. Nat. Hist., 1889, 381.

Chaunax fimbriatus, HILGENDORF, Sitzungsber. Gesellsch. Naturf. Freunde, 1879, 80 (*fide* Günther) [specimens from the Sea of Japan].—STEINDACHNER and DÖDERLEIN, Denkschr. K. Akad. Wiss. Wien, XLIX, 1887, 194.

Rostral tentacle, short, pedicellate; muciferous channels, appearing as chainlike rows of pits. Head, 1⅓; depth, 5½. Color, orange; sides, roseate; fins, scarlet.

Radial formula: D. I-11; A. 5; P. 11; V. 4; C. 7.

Numerous specimens have been obtained by the *Blake*, the *Fish Hawk*, and the *Albatross*, at depths of 130 to 428 fathoms, from the following stations: *Blake*, IX, off Barbados, 288 fathoms. *Fish Hawk*, 869 (No. 26021, Nat. Mus.), 192 fathoms: *Albatross*, 2359, 130 fathoms; 2395, 347 fathoms; 2396, 335 fathoms; 2212, 428 fathoms.

Lowe and Johnson both got it off Madeira. Günther found it in the *Challenger* collection taken near the Fiji Islands (station 173), 315 fathoms.

The *Talisman* obtained it at station LXXV, off Soudan, Africa, 830 meters, and at station CXIII, A, near the Cape Verdes, 760 meters. The *Investigator* dredged it in the Bay of Bengal, lat. 20° 17′ 30″ N., lon. 88° 51′ E., at a depth of 272 fathoms.

Günther has identified the German species described from the Sea of Japan as *C. fimbriatus* as being the same.

Descriptions and measurements of No. 26021 may be found in Goode, *loc. cit.* Although there is ample material and some of the specimens in the National Museum are very large, fuller study seems unnecessary, since they are undoubtedly Lowe's *C. pictus.*

The following color notes were taken by Dr. Bean from a fresh specimen taken in trawl, station 2357, January 22, 1885.

Back greenish gray, mottled with brown and tinged with rosy, supraocular region with golden reflections. Pectorals lemon yellow mingled with rosy; caudal like pectorals. Sides rosy. Under surface whitish and rosy intermingled. Pupil intense blue. Back with fine reticulations. Rostral tentacle greenish gold at base, the fimbriated portion lavender. Lines of mucous pores with reddish brown, well distinguished from the remaining colors. Labial fringes lemon yellow. Iris golden or rather lemon yellow.

The species inflates its abdomen like *Tetraodon* and has some difficulty in expelling the air so as to sink rapidly. The small gill-openings are closed very tightly during inhalation and a strong current of water is expelled in expiration.

Family CERATIIDÆ.

Ceratiidæ, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 89; Arr. Fam. Fish., 1872, 2 (No. 12); Proc. U. S. Nat. Mus., I, 1878, pp. 216, 227.

Pediculates with head and body compressed. Mouth terminal, more or less oblique. Gill-openings small, in the lower part of the axils. No pseudobranchiæ. Spinous dorsal represented by at least a frontal and superior rostral spine. Pectoral members not geniculated, with short pseudobrachia and three actinosts. No ventral fins. All known forms are uniform blackish in color.

"The 'bathybial sea devils,'" writes Günther, "are degraded forms of *Lophius;* they descend to the greatest depths of the ocean. Their bones are of an extremely light and thin texture, and frequently other parts of their organization, their integuments, muscles, and intestines are equally loose in texture when the specimens are brought to the surface. In their habits they probably do not differ in any degree from their surface representative, *Lophius.*

"When the first individuals of this group were discovered they seemed to be sufficiently distinct from one another to justify generic separation. However, the additions of recent years exhibit that variation in the shape of the body, head, and mouth, in the specialized dorsal spines, and in the development of dermal scutes, which may be expected in such grotesquely formed creatures.

"The number of the dorsal spines is always reduced, and at the end of the series of these species only one spine remains, with a simple, very small lamella at the extremity (*Melanocetus Johnsonii, Melanocetus Murrayi*). In other forms sometimes a second cephalic spine, sometimes a spine on the back of the trunk is preserved. The first cephalic spine always retains the original function of a lure for other marine creatures, but to render it more effective a special luminous organ is sometimes developed in connection with the filaments with which its extremity is provided (*Ceratias bispinosus, Oneirodes Eschrichtii*). So far as it is known at present these complicated tentacles attain to the highest degree of development in *Himantolophus* and *Ægœonichthys.* In other species very peculiar dermal appendages are developed, either accompanying the spine on the back or replacing it. They may be paired or form a group of three; are pear-shaped, covered with the common skin, and perforated at the top, a delicate tentacle sometimes issuing from the foramen."

KEY TO THE GENERA OF CERATIIDÆ.

- I. Mouth moderate.
  - A. Branchiæ in 2½ pairs.
    - 1. Mouth-cleft nearly vertical; skin prickly. .... *Ceratiinæ*
      - *a.* Two cephalic spines, no dorsal spine, no caruncles; vomerine teeth .... DICERATIAS
      - *b.* One cephalic and one dorsal spine, with lateral caruncles; no vomerine teeth .... CERATIAS
      - *c.* One cephalic spine, no dorsal spine; caruncles present.
        - i. Caruncles remote from soft dorsal .... MANCALIAS
        - ii. Caruncles close to soft dorsal .... CRYPTOPSARAS

2. Mouth-cleft nearly horizontal; skin smooth; one cephalic, and one postcephalic spine..ONEIRODES
3. Mouth-cleft oblique; two cephalic and no postcephalic spines ....................PARONEIRODES
B. Branchiæ in ½ 2 ½ pairs; body with scattered tubercular scutellæ; no second dorsal spine. *Himantolophinæ*
1. Body and head compressed, mouth with cleft oblique; mandibular articulation under or behind eyes
a. Eyes rudimentary.
i. Body oblong-oval; dorsal rays about 9, pectoral about 12 ..........HIMANTOLOPHUS
ii. Body short-oval; dorsal fin with 4 rays, and pectoral with about 17..CORYNOLOPHUS.
2. Body and head depressed, mouth with cleft vertical or inclined forward; mandibular articulation under or in advance of snout.
a. Eyes small ....ÆGÆONICHTHYS
II. Mouth immense.
A. Mouth with cleft subvertical. Pectoral small, premedian, in advance of dorsal and of gill opening. No second dorsalspine developed.
1. Branchiæ in 2½ pairs...*Melanocetinæ*
a. Gular tentacle not developed.
i. Vomerine teeth present...MELANOCETUS
ii. Vomerine teeth absent ....LIOCETUS
b. Gular tentacle present.
i. A single vomerine tooth..LINOPHRYNE
B. Mouth with cleft nearly horizontal. Pectorals broad, postmedian, under dorsal, and behind gill opening. Branchiæ in ½ 2 ½ pairs..*Caulophryninæ*
1. Dorsal and anal greatly produced.
a. Skin naked; numerous luminous filaments on head and body..................CAULOPHRYNE

CERATIAS, Kröyer.

Ceratias, KRÖYER, Naturhist. Tidsskrifft., I, 1844, 639 [type, *C. Holbölli*].—GILL, Proc. U. S. Nat. Mus., I, 1878, 217 (limited).

Ceratiids with head and body much compressed and elevated, oblong, with prickly skin. Mouth moderate, with its cleft nearly vertical; teeth in jaws of moderate size, conical, movable; no teeth on vomer or palatines. Branchiæ 2½ pairs; arches unarmed. Spinous dorsal reduced to two spines, the cephalic one elongate, with simple capitate extremity, the dorsal one with its basal element exserted; soft dorsal and anal short; pectorals very short, broad, multiradiate (with about 20 rays). Pyloric cœca 2, small. Skeleton soft, fibrous.

CERATIAS HOLBÖLLI, KRÖYER. (Figure 389.)

Ceratias Holbölli, KRÖYER, *loc. cit.*—GAIMARD, Voy. Skand., Poissons, Pl. IX.

This grotesque and remarkable fish is only known through three specimens, from 18 to 28 inches long, taken off Greenland, and another off Nova Scotia.

Günther, in the Study of Fishes (p. 472), erroneously stated that it had been found at the depth of 2,400 fathoms in mid-Atlantic, and corrected his identifications in the *Challenger* Report (XXII, p. 53); the form to which he referred was *Ceratias* or *Mancalias uranoscopus*. The brief diagnosis in Jordan's Synopsis is incorrect, and since the original Latin description of Kröyer is not easily accessible, we quote it in full below. *Ceratias Holbolli* may confidently be expected to be found in the abyssal waters south of Greenland, and probably occurs in the Great Atlantic Plateau.[1]

KRÖYER'S DESCRIPTION OF CERATIAS HOLBÖLLI.

Totus ater. Altitudo piscis quartam longitudinis partem ferme æquans. Caput altius quam longum, ⅓ longitudinis piscis æquans. Oculi minimi, vicesimam longitudinis capitis partem non superantes. Radius capitis liber longitudine piscis ad basin pinnæ caudalis

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[1] The form described by Günther under the name *Ceratias bispinosus*, from off Banda Islands, in the Molucca Archipelago, at a depth of 360 fathoms, resembles in general *Melanocetus Johnsonii*, though structurally closer to *C. Holböllii*. It is much shorter and chunkier, and has two dorsal spines, the posterior of which is rudimentary. Günther has used in connection with it (in his key to the species) the term *Diceratias*, no doubt more with the purpose of preventing others from making his species the basis of a new genus or subgenus than of himself advocating so limited a generic group. (Günther, *Challenger* Report, XXII, 53, Pl. XI, Fig. B.)

paullo modo brevior. Longitudo pinnæ caudalis lanceolatæ dimidia totius piscis longitudine parum brevior; longitudo pinnæ pectoralis vicesimam ferme æquans longitudinis totius piscis partem. Membrana conjungens pinnæ dorsalis posterioris pinnæque analis ad basin pinnæ caudalis fere extensa. Numerus rad. pin. dors. 1+1+4; pect. 19; anal. 4; caud. 8.

MANCALIAS, Gill.

Mancalias, GILL, Proc. U. S. Nat. Mus., I, 1878, 227 [type, *Ceratias uranoscopus*, MURRAY].—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 848.—GÜNTHER, Challenger Rep., XXII, 52.

Typhlopsaras, GILL, Forest and Stream, 1883, 284 (Nov. 8).—JORDAN, Cat. Fish. North America, 1885, 138.

Ceratiids with elongated trunk and rectilinear back; mouth moderate; cephalic spine with basal element exserted and continuous with the distal; pyloric cœca developed (2); mouth with cleft subvertical; first dorsal with few rays; branchiæ in 2½ pairs; branchial arches unarmed; skin with scattered spinigerous scutellæ; no second dorsal spine developed (as in *Ceratias*), but with two fleshy claviform tubercles existing, as in *Ceratias*; pectorals with about 10–15 slender rays instead of nearly 20, as in *Ceratias*. (*Gill.*)

MANCALIAS URANOSCOPUS, (MURRAY), GILL.

Ceratias uranoscopus, MURRAY, in Thomson's Voyage of the Challenger, 1878, II, 67, Figure 20.—GÜNTHER, Challenger Report, XXII, 54, pl. XI, Fig. C.

Mancalias uranoscopus, GILL, *loc. cit.*—GOODE, Proc. U. S. Nat. Mus., III, 1880, 469.

Ceratias Hölbüllii GÜNTHER in Bradys Report in Challenger Copepoda, 1883, 137.

Mancalias was first taken by H. M. S. *Challenger*, at a depth of 2,400 fathoms, in the Middle Atlantic, between the Canary and Cape Verde Islands. The specimen, 3¼ inches long, and indifferently preserved, is in the British Museum.

The specimen is 90 millimeters in length from the snout to the end of the tail, compressed laterally, and of a uniform black color. The anterior spine of the first dorsal fin is produced into a long filament, ending in a pear-shaped bulb, terminating in a very distinct, semitransparent, whitish spot. This spine has its origin on the posterior portion of the head, and when laid back it reaches nearly to the tip of the tail. The second part of the first dorsal is placed far back on the body, and consists of 2 short, fleshy tubercles, which lie in a depression in front of the second dorsal fin. The second dorsal has 3 rays; the anal is opposite the second dorsal and has 4 rays; the caudal has 8 rays, the 4 central rays being much larger than the others, and bifid. The pectorals are small and have 10 very delicate rays. The gill opening is a slit situated below the pectoral fin. The upper jaw is formed by the intermaxillaries, and is armed, together with the lower jaw, with a series of teeth of moderate size, which can be depressed inward as in *Lophius*. The skin is thickly covered with minute, embedded, conical spines. The eyes are very small and are placed high up on the middle of the head.

The presence of a fish of this group at so great a depth is of special interest. From its structure, and from the analogy of its nearest allies, there seems to be no reasonable doubt that it lives on the bottom. It is the habit of many of the family to lie hidden in the mud, with the long dorsal filament and its terminal soft expansion exposed. It has been imagined that the expansion is used as a bait to allure its prey, but it seems more likely that it is a sense organ, intended to give notice of their approach.

MANCALIAS SHUFELDTII, GILL. (Figure 401.)

Typhlopsaras Shufeldti, GILL, Forest and Stream, New York, Nov. 8, 1883, 284.—JORDAN, Cat. Fish. North America, 1885, 138.

Ceratias Shufeldti, GÜNTHER, Challenger Report, XXII, 54.

The specimens of *Mancalias* obtained in the Western Atlantic are two in number.

A single specimen, No. 26159, 85 millimeters long, was taken October 2, 1880, at station No. 893, at a depth of 372 fathoms. (Goode, Proc. U. S. Nat. Mus., III, 419.)

The type of *Typhlopsaras Shufeldtii* (No. 33552, U. S. Nat. Mus.), has the maxilla one-third the length from the gill opening to the caudal base; the intermaxilla is contained 3¼ times in this length. This form is more slender than that figured by Günther, and has five rays in the dorsal, and apparently fifteen in the pectoral.

There are no vomerines. The intermaxillary and mandible are armed with a narrow band of depressible teeth of various lengths. The skin has a fine granular appearance and is everywhere covered with minute prickles. The median dermal caruncle referred to in the description of this species has been torn off. The caruncles are only 2 in number and situated as in *Mancalias uranoscopus*, as figured in the Challenger Fishes. The length of the dorsal spine, without the joint bearing the pear-shaped appendage, equals the distance from the gill opening to the root of the tail; the joint bearing the appendage is two-fifths of this distance. The length of the specimen at present is about 2⅗ inches. In *Mancalias uranoscopus* (26159) the first dorsal, without the joint bearing the appendage, contains the distance from the gill opening to the root of the tail 1¼ times. The joint containing the appendage is one-half as long as the distance from the gill opening to the root of the tail. The dermal caruncles are distant from the dorsal a space equal to one-sixth of the distance from the gill opening to the root of the tail. In *Typhlopsaras Shufeldtii* the caruncles are placed at a distance from the dorsal a space contained 4½ times in the distance from the gill opening to the root of the tail.

In the specimens described by Goode and Bean as *Mancalias uranoscopus* (No. 26159), the length 3¼ inches, the length of the maxilla is one-third the length from the gill opening to the root of the tail, and the intermaxilla 3½ times in the same distance. The teeth in the jaws are depressible, in narrow bands, and of unequal size. The vomer is toothless.

There are two small caruncles not far from the front of the dorsal fin, and instead of being placed opposite each other, according to the usual arrangement, one is placed behind the other. The skin is covered with minute granules or papillæ, each one surmounted by a slender prickle, as in *Typhlopsaras*.

The pectoral of this individual contains 15 rays. The pectorals of *T. Shufeldtii* are imperfect.

In the note published by Dr. Goode in Proceedings U. S. Nat. Mus., vol. III, 1881, 469, the length of this specimen is stated to be 185 millimeters, which is a misprint for 85 millimeters.

CRYPTOPSARAS, Gill.

Cryptopsaras, GILL, Forest and Stream, Nov. 8, 1883, 284.

Ceratiines with shortened trunk, longitudinally convex back, small but conspicuous eyes, concealed basal joint of the anterior spine and elongated terminal joint, a large intermediate globular, and a pair of subpedunculated lateral dorsal appendages near the front of the dorsal fin, and well developed pectorals of about 15 rays. (*Gill.*)

Günther's *Ceratias carunculatus* was obtained by the *Challenger* from a depth of 345 fathoms, at station 232, south of Yeddo, in Japan, the single specimen being 1½ inches long.

CRYPTOPSARAS COUESII, GILL. (Fig. 402.)

Cryptopsaras Couesii, GILL, Forest and Stream, Nov. 8, 1883, 284.—JORDAN, Cat. Fish. N. A. 1885, 139.—[GÜNTHER, Challenger Report, XXII, 55.]
Ceratias carunculatus, GÜNTHER, *op. cit.*, 55, pl. XI, fig. D.

The basal joint of the rodlike spine is almost entirely concealed and procumbent, and the distal joint alone free, reaching backward to the dorsal tubercle; the bulb is pyriform, and surmounted by a long whitish filament; the dorsal and anal have each 4 spines, the caudal 8 (the 4 middle dichotomous), and the pectorals each about 15 rays. The species was named after the eminent ornithologist Dr. Elliott Coues. (*Gill.*)

A specimen of *Cryptopsaras* (Cat. No. 33558, U. S. Nat. Mus.) was obtained, by the *Albatross*, from station 2101, in 38° 18′ 30″ N. lat., 68° 24′ W. lon., at a depth of 1686 fathoms.

NOTES ON THE TYPE SPECIMEN.

The type of *Cryptopsaras Couesii*, at present is only 35 millimeters long, the caudal being imperfect. The length without caudal is 30 millimeters and contains the greatest height 2½ times. The bulb on the dorsal spine when laid backward can be made to reach the dermal caruncles on the back. The length of the upper jaw is about one-fourth of the length without caudal. The gill opening is nearly midway between the front of the head and the root of the tail. The mouth is placed vertically. The intermaxillary teeth occupy about the entire length of the bone. The mandibulary teeth are very unequal in size. At the symphysis of the mandible there is a pair of minute spines closely connected at the base and slightly separated at the extremity.

Specimen No. 39483 is 58 millimeters long; 47 millimeters to base of caudal. The greatest height is contained in the length without caudal 2⅝ times. The gill opening is a little nearer to the end of the caudal than to the front of the head. The distal portion of the dorsal spine is about one-half the length without caudal. The median dermal caruncle is very much larger than the two lateral ones.

The skin is covered with minute granules of uniform size. The pectoral contains 16 rays; its length is about one-fifth the length of the head. The length of the upper jaw is about one-fifth of the total without caudal. The pair of spines at the symphysis of the mandible is replaced by a very small knob. The teeth in the intermaxillary are all very small, diminishing in number towards the symphysis; they are apparently uniserial.

On each side of the head of the vomer there are two or three depressible teeth; the palatines seem to be wanting.

We have seen something like traces of similar teeth on the vomer of *Mancalias Shufeldtii*, but owing to the condition of the specimen can not be certain about this character.

ONEIRODES, Lütken.

Oneirodes, LÜTKEN, Overs. over d. K. Danske Vid. Selsk. Forhandl, 1871, 56-74 (type, *O. Eschrichtii*, Lütken).—GILL, Proc. U. S. N. M., I, 228.—GÜNTHER, Challenger Report, XXII, p. 55.
Onirodes, JORDAN and GILBERT, Bull. XVI, U. S. N. M., p. 848.

Ceratiids with very large head and body, compressed, oval, short, and naked; mouth moderate, with cleft nearly horizontal and mandibular articulation behind eyes; teeth depressible, unequal in size in the jaws, vomer dentigenous, branchial arches unarmed; branchiæ in 2½ pairs; pyloric cæca none; first dorsal spine cephalic, with a procumbent, subcutaneous basal element and a bulbous termination, surmounted by slender filaments in several transverse rows; second about midway from rostral spine to the soft dorsal fin; soft dorsal and anal fins short; ventrals none.

ONEIRODES ESCHRICHTII, LÜTKEN.

Oneirodes Eschrichtii, LÜTKEN, Overs. over d. K. Danske, Vid. Selsk. Forhandl., 1871, pp. 56-74, vea. fr. 9-18, pl. II.—GÜNTHER, Challenger Report, XXII. 56.—GILL, *loc. cit.*
Onirodes Eschrichti, JORDAN, *loc. cit.*

The only representative of this species is a specimen 8 inches long, taken off Greenland before 1871.

The original description by Lütken is appended:

Oneirodes Eschrichtii.—Genus et species nova e familia *Lophioideorum* (*Halibatrachorum*); nec non e tribu Lophioideorum apodum nudorum corpus breve, crassum, mediocriter compressum. Caput maximum, tetragonum, fronte declivi, profunde excavato; rictus oris mediocris, horizontalis; oculi minuti, absconditi; dentes mediocres, graciles, elongati, conici, subincurvi, mobilis in maxillis, in vomere et in pharynge supra; in pallato nulli. Apertura branchialis sat magna, infra insertionem pinnarum pectoralium; pseudobranchiæ. operculares nullæ; arcus branchialis primus branchiis destitutus; branchiorum paria 2½, cute arcum branchiale quartum cum osse hypopharyngeali conjugente; radii branchiostigi utrinque sex. Pinnæ ventrales nullæ (pectorales ignotæ). Radius frontalis cum osse interspinali horizontali subcutaneo articulatus, haud procul ab apice rostri insertus, sinum frontalem longitudine haud superans, clavæformis; caput clavæ compressum, tentacula plura minuta gerens; radius dorsalis (secundus) summo dorso impositus, conicus, depressus, flaccidus, frontalem longitudine superat. Pinna dorsalis vera et analis breves, caudali approximatæ, sed distinctæ; caudalis mediocris, haud elongata. Pinnarum formula radiorum: D. 1 + 1 + 6, P. V. o, A. 4, C. 8; radii molles, cartilaginei, haud articulati, caudales medianæ quatuor soli fissi. Squamæ nullæ; cutis nudis, mollis, niger totum corpus oblegit. Vesica notatoria et appendicis pyloricæ nullæ; ossa sceleti mollia, semispongiosa ut in piscibus affinibus, spinis binis frontalibus et mandibularibus exceptis nullibi in tubercula vel spinas prodeuntia.

DIMENSIONES SPECIMINIS DESCRIPTI.

	Mm.
Longitudo corporis totius ab apice rostri usque ad extremitatem pinnæ caudalis	205
Longitudo corporis totius ab apice rostri usque ad originem pinnæ caudalis	160
Altitudo maxima	105
Longitudo capitis inter spinas frontales	45
sinus oris	55
Longitudo maxillarum	54
Spinæ frontales ab apice rostri distant	55
a sinubus oris	52
Aperturæ branchialis altitudo	30
Radii frontalis longitudo	38
dorsalis	50
Pinnæ caudalis	45

PARONEIRODES, Alcock. (Figure 404.)

Paroneirodes, ALCOCK, Ann. and Mag. Nat. Hist., 1890, II, 206.

Ceratiids closely allied to *Oneirodes*, with ovoid, flaccid body. Mouth moderately large, with cleft obliquely ascending. A narrow band (?) of small teeth in each jaw and on vomer. Branchiæ in 2½ pairs. Eye rudimentary, buried deeply beneath a patch of transparent skin. Dorsal spines 2, clavate, close together, and near interorbital area. No postcephalic dorsal spine. Soft dorsal and anal short and very far back, almost confluent with caudal. Peduncles short and pointed. Ventrals none.

A single specimen, *Paroneirodes glomerosus*, Alcock (*loc. cit.*, pl. IX, fig. 6), represented by a specimen 1⅛ inches long taken by the *Investigator* in the Bay of Bengal, station 103, 1,260 fathoms, on a soft bottom of blue mud.

HIMANTOLOPHUS, Reinhardt.

Himantolophus, REINHARDT, K. Danske Vidensk. Selsk., Nat. og Math. Afh., 4, række, V, VII, 1837, 71.—LÜTKEN, K. Danske Vidensk, Selsk. Skrift., 1880, 320.—GILL, Proc. U. S. N. M., I, 1878, 227, 228.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 849.

Ceratiids with oblong-oval body, somewhat compressed, and large head, likewise compressed; mouth moderate, with oblique cleft and projecting mandible; mandibular articulation under or behind eye; teeth in several series in the jaws, unequal, rasp-like, depressible; palate toothless; branchial arches with dentigerous tubercles; gills in ½–2½ pairs; spinous dorsal a single tentacle, with numerous long filaments at its extremity, and with a procumbent, subcutaneous basal element; soft dorsal moderately short (with about 9 rays); anal short. Ventrals none. Pectoral moderately broad (with about 12 rays). Skin thick with round prickly scutes, sparsely distributed.

HIMANTOLOPHUS GRŒNLANDICUS, REINHARDT. (Fig. 405.)

Himantolophus grœnlandicus, REINHARDT, K. Danske vid. Selsk. Nat. og. Math. Afh. 4, række v, 7, 74, 1837.—LÜTKEN, *loc. cit.*, 1880, 320, pl. II, fig. 5.—GILL, *loc. cit.*, JORDAN, *loc. cit.*

The body is oblong oval; its height about two-fifths of its total length. The dorsal fin has about 9 rays and the pectoral about 12. The single cephalic ray representing the first dorsal fin is provided with about eleven tentacles.

This species has never been fully described, the only existing example being an imperfect one, 23 inches long, obtained off the coast of Greenland about 1837.

CORYNOLOPHUS, Gill.

Corynolophus, GILL, Proc. U. S. Nat Mus., I, 1878, 227; V, 1883, 551.—(LÜTKEN, Vidensk. Medd fra den Naturhist. Foren., Copenhagen, 1879–'80, 67, 68.)

Ceratiids resembling ***Himantolophus*** but having the body short-oval; dorsal with 5 rays; pectoral with about 7.

Dr. Gill, replying to certain strictures as to the validity of this genus, made by Lütken, states that the distinction alleged to exist between ***Himantolophus*** and ***Corynolophus*** are very marked, and quite sufficient to justify two genera. He forcibly remarks that there is no reason except ***the singularity and greatness, of the differences specified***, for doubting the correctness of Reinhardt's observations.

CORYNOLOPHUS REINHARDTII, (LÜTKEN), GILL.

Himantolophus Reinhardtii, LÜTKEN, K. Dansk. Vidensk. Selsk., 1880, 309, pls. I, II, figs. 1–4.—GÜNTHER, JORDAN, *loc. cit.*

Corynolophus Reinhardtii, GILL, Proc. U. S. Nat. Mus., I, 1878, 227; V, 1883, 551.

The body is short oval, its height three-fourths its length. The dorsal fin has 5 rays, the pectoral 17. The cephalic ray is provided with about 8 tentacles. The body armed with prickly scales, sparingly distributed.

A single specimen, 14 inches long, is known from the coast of Greenland.

ÆGEONICHTHYS, Clarke.

Ægeonichthys, CLARKE, Trans. New Zealand Institute, X, 1878, 245.—GILL, Proc. U. S. Nat. Mus., I, 1878, 227.

Ceratiids with body and head depressed, mouth with the cleft vertical, or inclined forward, and mandibular articulation under, or in advance of snout. (*Gill.*)

This is a form closely allied to ***Himantolophus***, and excelling it in grotesqueness. It is represented by a single species, *A. Appelii*, Clarke (*loc. cit.*, p. 245, pl. VI), obtained in the deep sea off New Zealand. Günther gives interesting details about the head of the cephalic spine, which is phosphorescent and a lure for other abyssal animals. (See Challenger Report, XXII, pp. 51, 52.)

MELANOCETUS, Günther.

Melanocetus, GÜNTHER, Proc. Zoöl. Soc. London 1864, 301 (type, *M. Johnsonii*, GÜNTHER) Challenger Report, XXII, 56.—GILL, *loc. cit.*

Ceratiids with naked skin; with very large mouth, having a subvertical cleft; with no second dorsal spine; with branchial arches unarmed and branchial in 2½ pairs.

MELANOCETUS JOHNSONII, GÜNTHER. (Figure 406.)

Melanocetus Johnsonii, GÜNTHER, Proc. Zoöl. Soc. London, 1864, 301, pl. 25.—Study of Fishes, 1880, 478, fig. 211; Challenger Report, XXII, 57.—GILL, *loc. cit.*

A single specimen, 3.8 inches long, is known. It was obtained by Mr. Johnson at Madeira, and had, it is said, a *Scopelus* 7½ inches long and 1 inch high, rolled up in a ball in its stomach.

"This singular fish," says Günther, "is distinguished by a greater disproportion of the various parts of its body than is found in the other genera of the family to which it belongs. The head is of tetrahedral form and is the most extensive part of the whole animal. The gape is enormous, and, although the lower jaw is vertical when the mouth is closed, it can be moved downwards at more than a right angle. The lateral extensibility of the mouth is not less than the vertical, so that the prey which can be received within the cavity of the mouth actually may exceed the size of the fish itself. This enormous head is followed by a very small trunk and tail, the length of both being less than the depth of the head. As the trunk would not offer sufficient room for an addominal cavity corresponding in size to the prey swallowed, this cavity is suspended as a large sac from the lower part of the body, and floats in the water. The upper and lower jaws are armed with a series of teeth, which are very unequal in length, some being very long, others small, all are very slender, and can be depressed toward the inside of the mouth. This peculiarity of the teeth may be observed in the *Lophius*, in the pike, and numerous other rapacious fish with long slender teeth. The vomer is armed with a transverse series of single teeth, and extends across the whole width of the roof of the mouth; the palatines and pterygoid teeth are situated at some distance behind the vomer, and form two bundles irregular in form. The pharynx and œsophagus are, as might be expected, very wide. The eye is situated high up on the side of the head; it is very small, covered by, but appearing through, the skin. There are no nasal openings. The opercular pieces are reduced to styliform rudiments; there are 5 branchiostegals. Only the three inner branchial arches bear short branchial lamellæ, which are disposed in a double series on the two middle ones, and in a single one on the innermost arch. The gill opening itself is a slit of moderate width, below and behind the pectoral fin. The upper surface of the head is concave, and in the middle of its anterior portion there is situated the single filament to which the anterior dorsal fin is reduced; this filament is more than half as high as the head, and dilated into a small lamella at its extremity. The second dorsal fin occupies the back of the tail, and is composed of 14 simple rays, none of which are as high as the fin is long. The caudal fin is quite free from the dorsal and anal, and composed of 8 very soft rays, which are bifid at the end, and form a convex posterior margin. Anal fin very short, composed of 4 rays only, which are opposed to the posterior dorsal rays. The base of the pectoral fin is fleshy and enveloped in skin, as in other *Pediculati*. It is composed of 18 simple and feeble rays. Ventral fins none. Vent situated immediately behind the abdominal sac. The whole fish, even the inside of the mouth of the abdominal sac and of the stomach, is of a uniform black.

Total length (mouth closed), 3.8 inches; length of intermaxillary and of mandible, 1.4 inches.[1]

LIOCETUS, Günther.

Liocetus [subgenus], GÜNTHER, Challenger Report, XXII, 1887, 57. [Type, *Melanocetus Murrayi*, Günther.]

The subgenus *Liocetus* of Günther differs from *Melanocetus* chiefly in the absence of vomerine teeth.

LIOCETUS MURRAYI, GÜNTHER. (Figure 107.)

Melanocetus bispinosus, GÜNTHER., Study of Fishes, 1880, 173. (Name only.)
Melanocetus (Liocetus) Murrayi, GÜNTHER Challenger Report, XXII, 1887, pl. XI, fig. A.

Extremely similar to *Melanocetus Johnsonii*, but, singularly, there is no trace of vomerine teeth, whilst there is no distinction between the two species as regards the dentition of the jaws. The posterior angle of the mandible projects more and forms a salient point. The mouth is comparatively less wide, and the maxillary considerably shorter, being about two-fifths of the total length, without caudal, whilst it is rather more than one-half in the Madeiran species. Eye rudimentary. One cephalic spine, which is shorter than the maxillary. The last dorsal ray is connected by a short and delicate membrane with the caudal fin; most of the caudal rays are bifid, the longest shorter than the maxillary. Pectoral fin as much developed as in *Melanocetus Johnsonii*.

Entirely black.

	Lines.
Total length	44
Length of mandible	14
Length of maxillary	12
Length of caudal fin	10½

Radial formula: D. 1-13; A. 4; C. 9; P. 14.—*Günther.*

A young specimen, 44 lines in length, was taken by H. M. S. *Challenger* in the mid-

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[1] GÜNTHER, Proc. Zoöl. Soc., 1864.

Atlantic, at the depth of 1,850 fathoms (station 106); another of 13 lines at the depth of 2,450 fathoms (station 348).

LINOPHRYNE, Collett.

Linophryne, COLLETT, Proc. Zoöl. Soc. London, 1886, 138.—GÜNTHER, Challenger Report, XXII, 57.

"*Linophryne*," says Günther, "differs from *Melanocetus* in possessing a long tentacle at the throat." Collett's original description is as follows:

> Head enormous; the body slender, compressed, mouth oblique. Spinous dorsal reduced to a single cephalic tentacle, the basal part of which is erect, not procumbent. Teeth in the jaws on the vomer and the upper pharyngeals. Gill openings exceedingly narrow, situated a little below the root of the pectoral. Soft dorsal and anal very short; ventrals none. Abdominal cavity forming a sac, suspended from the trunk. Skin smooth; a long tentacle on the throat.

LINOPHRYNE LUCIFER, COLLETT. (Figure 408.)

Linophryne lucifer, COLLETT, Proc. Zoöl. Soc. London, 1886, 138, pl. XV.—GÜNTHER, Challenger Report XXII, 57.

A spinous projection above each orbit. Cephalic tentacle black, with a large ovate bulb, the upper half of which is white; gular tentacle much larger, terminating in two tongue-like appendages, which are furnished on the upper edge with a row of round, white papillæ.

Radial formula: D. 1/3; A. 2; C. 9; P. 14–15.

Collett tells the history of its capture as follows:

> A single specimen, with a total length of 49 millimeters, was caught by Capt. P. Andresen in May, 1877, floating in the sea (about 36° N. lat., 20° W. lon.), 3 degrees northwest of Madeira, and was presented to the museum of the Christiania University. During several years it remained unnoticed in the private house of the late director of the Christiania museum, Prof. Esmark, but after his death it was returned to the museum (December, 1885).
>
> Mr. Andresen, who is now residing in Christiania, reports to me that on the day mentioned he was on a voyage to the West Indies. He was capturing turtle in his boat; there was a heavy swell, but the water was smooth. After a time he caught sight of this little black fish, which lay on the surface quite alive, but almost motionless, which was not surprising when it was discovered that it had just swallowed a fish longer than itself. It did not lie on its side, but was apparently unable to swim away. By getting the bailer under it he lifted it out with ease, and in order to keep it fresh he gave up his search for turtle and rowed to the ship, where it was placed in spirits for preservation.

CAULOPHRYNE, Goode and Bean, n. g.

Head large, compressed. Mouth with the cleft nearly horizontal. Body short, much compressed. Spinous dorsal reduced to a single cephalic tentacle, which is supported on a short procumbent base. Teeth of unequal size in the intermaxillary and the mandible. Vomer, palatines, and upper pharyngeals toothed. Gill openings narrow, horizontal slits placed below and in front of the root of the pectorals. Branchiæ in ½–2–½ pairs. Branchial arches armed with dentigerous tubercles. Skin naked. Numerous luminous filaments on head and body. Soft dorsal and anal many rayed; the rays greatly produced. Caudal long, tapering. Ventrals none. Pectorals very broad, sessile, postmedian, under dorsal fin, with numerous rays. Pyloric appendages reduced to one small rudiment. Air bladder absent.

CAULOPHRYNE JORDANI, GOODE AND BEAN, n. s. (Figure 409.)

The height of the body is nearly one-half of the total length without caudal, the greatest height occurring just behind the head. The cephalic appendage has a pale tuft at its tip. The length of the distal portion of the appendage equals one-third of the total length without the caudal. The tuft is somewhat mutilated, but it shows no evidence of a laminated structure. The basal portion of the cephalic appendage is about twice as long as the very small eye. The maxillary is a very slender, narrow bone, extending about as far backward as the intermaxillary. The intermaxillary is slightly protractile and has about 10 teeth on each side, several of which are nearly twice as large as the rest; its length is two-fifths of the total without caudal. The mandible is as long as the head without the snout; it has 8 teeth on each side, the anterior pair and several other pairs along the shaft of the bone being greatly enlarged. A pair of enlarged teeth on the head of the vomer; several similar teeth on the palatines. Upper pharyngeals armed with several strong teeth. The eye very small, inconspicuous; its distance from the tip of the snout equals nearly one-third its distance from the origin of the soft dorsal. Intestine shorter than length without caudal.

The soft dorsal has 16 rays, all of which, except the last four, are greatly produced; the second, third, and fourth rays, are the longest; they are nearly twice as long as the body. The anal consists of 14 rays, all of which, except the last three, are much produced. The fin is not quite perfect, yet its anterior rays are longer than the body. The caudal contains 8 rays, of which the four inner ones are divided, while the rest are simple. The middle rays are as long as the distance from the tip of the lower jaw to the base of the pectoral. The pectoral is comparatively short and contains 16 simple articulated rays, the longest of which is about one-half as long as the head.

About 9 luminous filaments on each side of the head, 7 more between the nape and the dorsal, and about 12 on the sides. The filaments are nearly twice as long as the eye.

Head and body black; caudal cephalic tuft, and most of the fin-rays pale.

The type of the species is number 39265, taken by the steamer *Albatross*, September 19, 1887, in N. lat. 39° 27′, W. lon. 71° 15′, 1276 fathoms.

Family ONCHOCEPHALIDÆ.

Malthæoidei, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 89 (diagnosis).
Malthæoidæ, GILL, Arrangement Families of Fishes, 1872, 2 (No. 10); Proc. U. S. N. M., I, 1878, 215-219 (diagnosis) p. 231 (key to subfamilies and genera); v, 1883, 555 (with elaborate synonymy).
Malthidæ, JORDAN and GILBERT, Bull. 16, U. S. Nat. Mus., 849 (diagnosis and key).
Onchocephalidæ, GILL, MS.

Pediculates with very broad and depressed head, with snout more or less elevated, with trunk short and slender. Mouth not large, subterminal or inferior, the lower jaw included; teeth villiform or cardiform. Gill openings very small above and behind the axils of the pectoral fins. Body and head covered with bony tubercles or spines. Spinous dorsal reduced to a small rostral tentacle, which is retractile into a cavity under a prominent process on forehead; in one genus the rostral tentacle is obsolete; soft dorsal and anal small and short; ventrals well developed; pectoral well developed, its base strongly angled, with long pseudobrachia and 3 actinosts. Branchiostegals 5; no pseudobranchiæ.

KEY TO THE SUBFAMILIES AND GENERA.

I. Body with disk cordiform and caudal portion stout.
A. Frontal region elevated, and snout more or less produced or attenuated forwards..... *Onchocephalinæ*
1. Orbits lateral, teeth on vomer and palatines.
a. Gills 2½ ....ONCHOCEPHALUS
b. Gills 2...MALTHOPSIS (See Appendix.)
II. Body with disk subcircular or expanded backwards and caudal portion slender; frontal region depressed, and snout rounded and obtuse in front .... *Halieutæinæ*
A. Palate edentulous; rostral tentacle developed; carpus exserted from common membrane.
1. Disk subcircular; gills 2½ pairs.
a. Mouth cleft wide, subvertical. Prickles strong ....HALIEUTÆA
b. Mouth small, terminal. Prickles feeble..HALIEUTELLA
2. Disk subtriangular; mouth small; gills 2 pairs ....DIBRANCHUS
B. Palate dentigerous; dorsal fin obsolete; rostral tentacle present ....HALICMETUS
C. Palate and vomer dentigerous; dorsal present; no rostral tentacle..................HALIEUTICHTHYS

ONCHOCEPHALUS, (Fischer), Gill.

Ogcocephalus, FISCHER, Zoognosia, 1813, 78.
Onchocephalus, GILL, MS.
Malthe, CUVIER, Règne Animal, 1st ed., 1817, II, 311.—GÜNTHER, Cat. Fish Brit. Mus., III, 200.—JORDAN and GILBERT, Bull. XVI, U. S. N. M., 850.

Maltheids with head very large, much depressed, subtriangular; cranial portions elevated, with orbits lateral. Mouth protractile, subrostral, horizontal; jaws convex; villiform teeth on jaws, vomer, and palatines. Branchiæ 2½, the anterior arch without lamellæ. Soft dorsal fin very low. Pectorals large, placed horizontally. Ectoderm armed with osseous tubercles. Air bladder and pyloric cæca wanting. Habitat: Western Atlantic from Brazil to Cape Cod and eastward to Bermudas.

This genus includes two species; one, *M. radiata*, occuring in deep waters off the coast of North America; the other, the polymorphic *M. vespertilio*, from Brazil to Cape Cod, and perhaps still farther northward. It has been found at 95 fathoms.

ONCHOCEPHALUS RADIATUS,(MITCHILL), GOODE and BEAN.

Lophius radiatus, MITCHILL, Amer. Monthly Magazine, II. 1818, 326. (Specimen from the Straits of Bahama)
Malthe radiata, JORDAN, Proc. U. S. Nat. Mus., VII. 144. (Eel grass about Key West).
Malthe cubifrons, RICHARDSON, Fauna Boreali-Americana, Fishes, 103, pl. 96.—GÜNTHER, Cat. Fish. Brit. Mus., III, 203.—GOODE, Proc. U. S. Nat. Mus., II, 109 (St. Augustine?).
Malthea nasuta, AUCTORUM.

This species, first described by Mitchill from the straits of Bahama, was also described by Richardson from a specimen presented to him by Audubon, professedly from Labrador, but more probably belonging to the South Carolina collection transmitted at the same time. Richardson's type, now in the British Museum, was carefully studied by Dr. Bean, whose measurements are appended.

Jordan is of the opinion that this species is a form of *M. vespertilio*, a conclusion which does not seem untenable when we consider the immense variation of individuals which has forced even the conservative Günther to bring together as identical the forms described by Cuvier and Valenciennes as *Malthea longirostris*, *M. nasuta*, *M. notata*, *M. angusta*, and *M. truncata*.

Günther' was doubtless influenced by the supposed difference of locality to leave *M. radiata* in a separate species.

Appended are measurements of the typical example and of an individual of nearly equal size from Pensacola, Florida. The species is not uncommon on the east coast of Florida, but has only once been recorded from Labrador. The type was presented to Sir John Richardson by Audubon, who may have been misinformed as to its origin.

In the Pensacola example, No. 31908, the dorsal surface of the body is dark gray, with numerous small, roundish black spots having a whitish origin. The under surface is light gray. The largest body spots are one-fourth as long as the eye. The upper side of the pectorals have spots similar to those of the body, but more elongate and irregular. The cheeks are spotted like the sides of the body. The tubercles are largest and most numerous along the dorsal surface of the body. The caudal peduncle is thick and heavy. The nasal tentacle is trilobate at the tip. The posterior nostril is more than twice as large as the anterior, which has a rudimentary tube. The teeth are in villiform bands on the vomer, palatines, and in the jaws. The vent is behind the middle of the length to caudal base.

Upon examination of the measurement table it will be apparent that the actual differences between the two examples are so slight as to remove all doubt concerning their specific identity.

MEASUREMENTS.

Current number of specimen... Locality...	a. Labrador.		31908. Pensacola, Fla.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Length to origin of middle caudal rays	161	....	171	....
Body:				
Height at ventrals	40	25	35	20.5
Least height of tail	15	9	15	8.8
Length of caudal peduncle	55	34	56	32
Head:				
Greatest length	76	47	80	46.8
Height of rostral groove	6	3.7	7	4
Width of rostral groove	8½	5	7	4
Greatest width	96	60	94	55
Width of interorbital area	13	8	12	7
Length of snout, including tubercle	5	3	6	3.5
Length of nasal tubercle	4½	2.8	4½	2.5
Width of nasal tubercle	4½	2.8	4½	2.5
Length of maxillary	15	9	14	8
Length of mandible	13	8	15	8.8
Distance between anterior orbital angles	*17	10.5	†16	9.3
Diameter of eye	14	8.7	13	7.3
Dorsal:				
Distance from snout	103	64	110	64
Dorsal—Continued.				
Length of base	7	4.3	7	4
Height at second ray	10(?)	....	17	....
Anal:				
Distance from snout	133	82.6	139	81
Length of base	‡7	4.3	§12	....
Longest ray	ca. 20	12.5	ca. 25	14.5
Caudal:				
Length of middle rays	39	24	42	24
Length of external rays	32	20	35	20.5
Pectoral:				
Distance from snout	94	58	97	57
Length	32	20	38	22
Ventral:				
Distance from snout	56	34.8	61	36
Length	ca. 30	18.6	30	17.5
Distance of vent from snout	....	....	90	58
Dorsal	....	....	4	....
Anal	....	....	4	....
Pectoral	....	....	12–13	....
Ventral	....	....	5	....

* Between posterior angles, 20.
† Between posterior angles, 17,
‡ The membrane lacking.
§ Including membrane.

ONCHOCEPHALUS VESPERTILIO, (LINNÆUS), GOODE and BEAN.

Lophius vespertilio, LINNÆUS, Syst. Nat. Ed. x, 1, 236.
Malthe vespertilio, CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 440.—GOODE, Bull. VI, U. S. Nat. Mus. (full synonymy).

A *Malthe*, with distance between the anterior angles of orbits less than that between the posterior angles; a subconical process projecting forward from the head, variable in length but longer than in the other species (about one-tenth of total); rostral groove longer than broad. Color, grayish-brown above, tawny below.

Radial formula: D. 4; A. 4.

Specimens were obtained by the *Blake* at station CLXIX, in 24° 46′ N. lat., 83° 16′ W. lon., at a depth of 36 fathoms, and at station CLXXI, in 24° 43′ N. lat., 83° 25′ W. lon., at a depth of 37 fathoms. Also, by the *Albatross* from station 2311, in 32° 55′ N. lat., 77° 54′ W. lon., at a depth of 79 fathoms; from station 2313, in 32° 53′ N. lat., 77° 53′ W. lon., at a depth of 99 fathoms; from station 2362, in 22° 08′ 30″ N. lat., 86° 51′ 15″ W. lon., at a depth of 25 fathoms; from station 2402, in 28° 36′ N. lat., 85° 33′ 30″ W. lon., at a depth of 111 fathoms; from station 2404, in 28° 44′ N. lat., 85° 16′ W. lon., at a depth of 60 fathoms; from station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms; from station 2406, in 28° 46′ N. lat., 84° 49′ W. lon., at a depth of 26 fathoms; from station 2417, in 33° 18′ 30″ N. lat., 77° 07′ W. lon., at a depth of 95 fathoms, and from station 2318, in 24° 25′ 45″ N. lat., 81° 46′ 45″ W. lon., at a depth of 45 fathoms.

HALIEUTÆA, Cuv. and Val. (Figure 403.)

Halieutæa, CUVIER and VALENCIENNES, Hist. Nat. Poiss. XII, 455.—GÜNTHER, Cat. Fish. Brit. Mus., III, 203.

Maltheids with subcircular body disk, and slender caudal peduncle, with depressed frontal region and snout rounded and obtuse, and with conspicuous rostral tentacle. Mouth large, palate toothless. Carpus exserted. Gills in 2½ pairs.

This genus was known only from the northwest Pacific, where the *Halieutæa stellata*, whose dried skin is so familiar in the insect boxes made up for sale to visitors, occurs at considerable depth. In 1889 the *Investigator* obtained a new species, pink and crimson in color, in the Andaman Sea, in 265 fathoms, which Alcock names *Halieutæa coccinea*. (Fig. 410.)[1]

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[1] Ann. & Mag. Nat. Hist., 1889, 382.

HALIEUTELLA, Goode and Bean.

Halieutella, GOODE and BEAN, Proc. Biol. Soc. Washington, II, 1882, 88.

Body maltheiform, subcircular, depressed, its width equal to its length; covered with flaccid, inflatable skin. Spines feeble and less numerous than in *Halieutæa.* Head merged in body; forehead with a transverse bony ridge; no perceptible supraoral cavity; no tentacle. Mouth small, terminal; lower jaw slightly curved forward. Teeth in the jaws minute, cardiform; not discernible on palate, though possibly present. Carpus broad, slightly exserted. Pectoral fins remote from tail, obliquely placed, with membranes subvertical. Branchial aperture posterior to carpus, upon the disk, and not remote from its margin. Gills 2½. Teeth on palate. Dorsal fin 5-rayed, inserted at junction of disk with caudal peduncle. Anal fin 4-rayed, originating at root of caudal peduncle.

HALIEUTELLA LAPPA, GOODE and BEAN. (Figures 412, A, B.)

Halieutella lappa, GOODE and BEAN, *loc. cit.*

Disk subcircular, more than two-thirds as long as the body. Body covered with a loose, flaccid, inflatable skin, which so obscures its proportions that it is impossible to determine its exact height, but it is not nearly so much depressed as in the related genera. When the body is inflated the height and length of the disk are nearly equal.

Spines rather feeble; about 10 between snout and dorsal fin. About 6 strong spines, with conical bases and stellular tips on the outer margin of the disk on each side, the anterior of them being opposite the eye. In front of these spines on the discal margin, and between them and the snout, are several small, simple spines, pointing backward. Belly armed with spines similar to those on the back, but weaker. A stellate spine upon the tip of the snout, with two weaker, simple spines on each side. Nasal openings midway between eye and tip of snout. Mouth small, upon the margin of the disk. The upper jaw is shorter than the diameter of the eye. Teeth as described in the generic diagnosis. Dorsal fin inserted at posterior limit of disk, with five simple, articulated rays, its longest ray one-fifth as long as the disk. Anal fin with four simple, articulated rays, inserted directly beneath the fourth ray of the dorsal; its second, and longest, ray one-fourth as long as the disk. Caudal twice as long as anal, and slightly longer than caudal peduncle, with nine simple, articulated rays. Carpus inserted at a distance from the snout equal to twice the length of the longest pectoral ray, which is slightly greater than the distance of posterior margin of carpus, at its junction with disk, from vent. Number of pectoral rays, 15. Ventral inserted at a point equidistant from the snout and the origin of the anal; length of its longest ray (the fourth) equal to one-half the distance of the anal fin from the snout.

Radial formula: D. 5; A. 4; C. 9; P. 15; V. 5.

Color, yellowish white.

A single specimen, 1¼ inches long, was dredged by the U. S. Fish Commission steamer *Fish Hawk* at station 1151, N. lat. 39° 58′ 30″, W. lon. 70° 37′, in a depth of 125 fathoms.

DIBRANCHUS, Peters.

Dibranchus, PETERS, Monatsberichte, König. Akad. Wiss., Berlin, 1875-'76, 736, (type, *D. atlanticus*, Peters).—GILL, Proc. U. S. Nat. Mus., I, 231.

Halieutæa, (part) GOODE, Proc. U. S. Nat. Mus., III, 467.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 851.

Maltheids with head merged in body, very large, much depressed, forming a broadly ovate disk, with margin prolonged laterally to a greater extent than in the allied genera. Cranial portion of disk not elevated. Interorbital area low, narrow, with orbits partly superior. Supra-oral cavity large, protected above by transverse bony ridge.

Mouth terminal, horizontal, wide; lower jaw convex, teeth in cardiform bands upon jaws; vomer and palatines edentulous.

Branchiæ 2, the first and fourth arches without lamellæ, the fourth arch inconspicuous. Branchial apertures small, anterior to pectoral and upon disk.

Tentacle representing first dorsal fin retractile, with dilated trilobate tip. Soft dorsal fin seven-rayed, inserted posterior to discal margin.

Anal fin behind dorsal. Pectorals median, carpus narrow, slightly exserted, horizontally placed.

Ectoderm covered with numerous and strong stellular spines, above and below; the spines being particularly strong and three-pointed at the margins of the disk. Tongue, air bladder, and pyloric appendages wanting.

DIBRANCHUS ATLANTICUS, PETERS. (Figure 413.)

Dibranchus atlanticus, PETERS, Monatsberichte, Königlich Preussischen Akademie, Wissenschaften, Berlin, 1875 (76) 736), Coll. of H. M. S. *Gazelle*, coast of W. Africa, lat. 10° 12′ 9″ N; lon. 17° 25′ 5″ W; depth, 360 fms.); plate with 5 figs.—GÜNTHER, Challenger Rep., XXII, 59.—VAILLANT, Travailleur, 1888, 343.

Halieutæa senticosa, GOODE, Proceedings U. S. Nat. Mus., III (sig. 29, Jan. 31, 1881), 67. (Coll. of U. S. F. C., 1880, off Newport, R. I., depths 225 and 238 fms.),—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 851.

A species of *Dibranchus* with orbicular disk, nearly as wide as long; its length about half that of the body; its lateral outline prolonged on each side, and terminating in a strong spine, armed at the tip with a group of irregularly arranged acicular spinelets. Body covered above with numerous stout, conical spines with stellular bases. These are largest upon the trunk, where they are approximately arranged in about four irregular longitudinal rows upon each side of the dorsal fin. Closely set rows of these stout spines mark the outer margin of the disk, and there is also a cluster of five to seven upon each carpal peduncle. Outside of these marginal spines, upon each side, is an irregular marginal row of five depressed, knife-like spines, each tipped with a crown of three acicular spinelets. On the anterior margin of the disk the two rows coalesce to a greater or less extent and form a bristling array of closely set spines, some pointing dorsally, some laterally, some ventrally. There are two kinds of spines upon the dorsal surface, in addition to the large ones already described; some large, somewhat remote from each other, conical, stellular; others, much more numerous and filling the interspaces, prickle-like, stellular. Belly armed with numerous closely set spines of a similar kind. Snout somewhat projecting, armed with three many-tipped spines. A spine-armed ridge in front of the eyes, over the top of the snout. In this 4 spines are conspicuous, one in front of each eye, and between these a larger pair, in front of the supraorbital ridges. From these last mentioned spines extend spine-armed ridges along the upper margins of each orbit. Under the snout is a cavity (horizontal diameter ½ that of orbit) containing a barbel, pedicelled, with thick, club-shaped, trilobate tip. On each side of this cavity are the nasal openings, which are as in *Halieutichthys*.

The width of the mouth is equal to the distance between the centers of the pupils of the eyes.

The diameter of the orbit is contained as follows in other dimensions of the body: In total length, 9½; in distance from snout to dorsal, 6; same to anal, 7; the base of ventrals, 3; to angle between pectorals and trunk, 5½; to gill opening, 5; in greatest width of disk, 5½; of trunk, 4. Width of interorbital area in diameter of orbit, ⅔.

Dorsal fin with 6 or 7 rays, the longest (3d) 1½ times diameter of orbit, and 6 times in total length. Anal fin inserted entirely behind dorsal, with 4 rays, the longest (3d) about as long as longest in dorsal fin. Ventral fins inserted nearly under middle of disk, a little nearer to vent than to mandibular symphysis, with one rudimentary and five well developed rays, increasing in length posteriorly, the last and longest 6½ times in total. Distance between ventral origins, 7½ in total length.

Pectorals with peduncles slightly exserted, bases included in common membrane, composed of 13 to 15 rays, the longest (3d or 4th) 4⅔ in total.

Caudal fin rounded, consisting of 9 rays, all bifid or trifid except the two external ones; length of middle ray, about half that of trunk and exceeding that of the pectoral, being contained 4⅓ times in total length.

Stomach egg-shaped, intestines somewhat longer than body. Liver very wide and large. Color, uniform reddish, gray above, slightly lighter below.

Radial *formula:* D. 6–7; A. 4; C. 9; P. 13–15; V. I, 5; B. 6. Gills 2.

MEASUREMENTS.

Current number of specimen Locality	26175. Station 895.	
	Millimeters.	100ths of length.
Extreme length	140	
Length to base of middle caudal rays	118	100
Body:		
Greatest width of disk		50
Length of disk (snout to lateral spine)		47
Length of disk (snout to angle of pectoral)		47
Least height of tail		5
Length of body (outside of disk)		40
Head:		
Greatest length (to branchial opening)		39
Width of interorbital area		8
Length of snout		4
Width of mouth		16
Length of maxillary		9
Length of mandible		10
Diameter of orbit		8
Dorsal:		
Distance from snout		60
Length of base		8
Greatest height		14
Length of rostral barbel		3
Anal:		
Distance from snout		65
Length of base		5
Height at longest ray		14
Caudal: Length of middle rays		13
Pectoral:		
Distance of elbow from snout		52
Length		24
Ventral:		
Distance of free portion from snout		35
Length		12
Dorsal		6
Anal		4
Caudal		8
Pectoral		13–15
Ventral		5

The *Challenger* obtained 4 specimens off the west coast of Africa (Lat. 10° 12′ N., lon. 17° 25′ W.) at a depth of 360 fathoms. The *Talisman* dredged it off the Cape Verdes (station CXII) in 405 meters. The American specimens were obtained from the following localities:

The *Blake* secured specimens of this species from the following localities: Off Barbados at a depth of 73 fathoms; off the Grenadines at a depth of 164 fathoms and at station CLXXIX, in 28° 42′ N. lat., 88° 40′ W. lon., at a depth of 321 fathoms. Also the *Albatross* from station 2608, in 34° 32′ N. lat., 76° 12′ W. lon., at a depth of 22 fathoms; Cat. No. 35448, U. S. N. M., from station 2183, in 39° 57′ 45″ N. lat., 70° 56′ 30″ W. lon., at a depth of 195 fathoms; Cat. No. 35683, U. S. N. M., from station 2246, in 39° 56′ 45″ N. lat., 70° 20′ 30″ W. lon., at a depth of 122 fathoms; Cat. No. 35403, U. S. N. M., from station 2180, in 39° 29′ 50″ N. lat., 71° 49′ 30″ W. lon., at a depth of 523 fathoms; Cat. No. 32810, U. S. N. M., from station 2014, in 36° 41′ 05″ N. lat., 74° 38′ 55″ W. lon., at a depth of 373 fathoms; Cat. No. 35504, U. S. N. M., from station 2212, 39° 59′ 30″ N. lat., 70° 30′ 45″ W. lon., at a depth of 428 fathoms; Cat. No. 35698, U. S. N. M., from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms; Cat. No. 35482, U. S. N. M., from station 2186, in 39° 52′ 15″ N., lat., 70° 55′ 30″ W. lon., at a depth of 353 fathoms; Cat. No. 35684, U. S. N. M., from station 2262, in 39° 54′ 45″ N. lat., 69° 29′ 45″ W. lon., at a depth of 250 fathoms; Cat. No. 33515, U. S. N. M., from station 2092, in 39° 58′ 25″ N. lat., 71° 00′ 30″ W. lon., at a depth of 197 fathoms; from station 2376, in 29° 03′ 15″ N. lat., 88° 16′ W. lon., at a depth of 324 fathoms; from station 2396, in 28° 34′ N. lat., 86° 48′ W. lon., at a depth of 335 fathoms; from station 2232, in 38° 37′ 30″ N. lat., 73° 11′ W. lon., at a depth of 243 fathoms; from station 2536, in 39° 56′ 15″ N. lat., 70° 47′ 30″ W. lon., at a depth of 157 fathoms; from station 2028, in 39° 57′ 50″ N. lat., 70° 32′ W. lon., at a depth of 209 fathoms; from station 2025, in 40° 02′ N. lat., 70° 27′ W. lon., at a depth of 239 fathoms; from station 2027, in 39° 58′ 25″ N. lat., 70° 37′ W. lon., at a depth of 198 fathoms; from station 2125, in 11° 43′ N. lat., 69° 09′ 30″ W. lon., at a depth of 208 fathoms; from station 2264, in 37° 07′ 50″ N. lat., 74° 34′ 20″ W. lon., at a depth of 167 fathoms; from station 2395, in 28° 36′ 15″ N. lat., 86° 50′ W. lon., at a depth of 347 fathoms; from station 2398, in 28° 45′ N., lat. 86° 26′ W. lon., at a depth of 227 fathoms; from station 2394, in 28° 38′ 30″ N., lat. 87° 02′ W. lon., at a depth of 420 fathoms; from station 2025, in 40° 02′ N. lat., 70° 27′ W. lon., at a depth of 239 fathoms; from station 2397, in 28° 42′ N. lat., 86° 36′ W. lon., at a depth of 280 fathoms; and from station 2396, in 28° 34′ N. lat., 86° 48′ W. lon., at a depth of 335 fathoms.

Specimens were also obtained by the *Fish Hawk* from the following localities: Cat. No. 26733, U. S. N. M., from station 898, in 37° 24′ N. lat., 74° 17′ W. lon., at a depth of 300 fathoms; Cat. No. 28784, U. S. N. M., from station 939, in 39° 53′ N. lat., 69° 50′ 30″, W. lon., at a depth of 264 fathoms; Cat. No. 26088, U. S. N. M., from station 879, in 39° 49′ 30″ N. lat., 70° 54′ W. lon., at a depth of 225 fathoms; Cat. No. 28727, U. S. N. M., from station 925, in 39° 55′ N. lat., 70° 47′ W. lon., at a depth of 229 fathoms; Cat. No. 28836, U. S. N. M., from station 951, in 39° 57′ N. lat., 70° 31′ 30″ W. lon., at a depth of 225 fathoms; Cat. No. 28795, U. S. N. M., from station 945, in 39° 58′ N. lat., 71° 13′ W. lon., at a depth of 207 fathoms; Cat. No. 29051, U. S. N. M., from station 1045, in 38° 35′ N. lat., 73° 13′ W. lon., at a depth of 312 fathoms; Cat. No. 26175, U. S. N. M., from station 895, in 39° 56′ 30″ N. lat., 70° 59′ 45″ W. lon., at a depth of 238 fathoms; Cat. No. 29071, U. S. N. M., from station 1049, in 38° 28′ N. lat., 73° 22′ W. lon., at a depth of 435 fathoms; Cat. No. 28907, U. S. N. M., from station 1025, in 39° 49′ N. lat., 71° 25′ W. lon., at a depth of 216 fathoms; Cat. No. 31881, U. S. N. M., from station 1154, in 39° 55′ 31″ N. lat., 70° 39′ W. lon., at a depth of 193 fathoms; Cat. No. 31765, U. S. N. M., from station 1140, in 39° 31′ N. lat., 71° 56′ W. lon., at a depth of 374 fathoms; Cat. No. 31761, U. S. N. M., from station 1142, in 39° 32′ N. lat., 72° 00′ W. lon., at a depth of 322 fathoms; Cat. No. 28898, U. S. N. M., from station 997, in 39° 42′ N. lat., 71° 32′ W. lon., at a depth of 335 fathoms; Cat. No. 28801, U. S. N. M., from station 946, in 39° 55′ 30″ N. lat., 71° 14′ W. lon., at a depth of 247 fathoms; Cat. No. 28737, U. S. N. M., from station 924, in 39° 57′ 30″ N. lat., 70° 46′ W. lon., at a depth of 164 fathoms; Cat. No. 31744, U. S. N. M., from station 1138, in 39° 39′ N. lat., 71° 54′ W. lon., at a depth of 168 fathoms; and five specimens from station 894, in 39° 53′ N. lat., 70° 58′ 30″ W. lon., at a depth of 365 fathoms. A single specimen was also captured off Block Island in 1880.

HALICMETUS, Alcock.

Halicmetus, ALCOCK, Ann. and Mag. Nat. Hist., July, 1891, 27.

Head and anteiior part of body very broad and depressed. Front with a transverse bony bridge and a subrostral cavity lodging a fleshy tentacle. Cleft of mouth horizontal. Villiform teeth in jaws and palatines. Gill-openings small, foramina situated superiorly in the axillæ; two gills; no pseudobranchiæ. Head and body with close set graniform asperities and large granular tubercles. No dorsal fin whatever. Anal fin very short. Pyloric appendages and air-bladder absent. Alcock.

This genus is represented by the single species, *Halicmetus ruber*, Alcock (l. c., pl. viii, Figs. 1, 1*a*, 1*b*), obtained by the "Investigator," in the Bay of Bengal, at Station 115, in 188-220 fathoms. Two specimens.

HALIEUTICHTHYS, Poey.

Halieutichthys (POEY), GILL., Proc. Acad. Nat. Sci. Phila., 1863, 89 (type, *Halieutichthys reticulatus*, Poey).—GILL., Proc. U. S. Nat. Mus., 232.—JORDAN and GILBERT, Bull. 16, U. S. Nat. Mus., 851.

Maltheids with head merged in body, very large, much depressed, anteriorly cordiform; cranial portion not elevated; interorbital area low and very narrow, orbits partly superior.

Mouth terminal, horizontal, protractile jaws equal, lower jaw nearly semicircular; villiform teeth upon jaws, vomer, and palatines.

Branchiæ two and one-half, the first arch without lamellæ. Branchial apertures anterior to pectoral, upon disk.

Superoral cavity small, containing a tentacle (representing aborted first dorsal), which is very retractile.[1]

Soft dorsal fin, few rayed, inserted at junction of disk with trunk. Anal fin few rayed. Pectorals large, carpus slender, not exserted, horizontally placed. Caudal rounded.

Ectoderm sparingly armed above with stellate tubercles, the posterior of which upon the disk mark the *contour* of the skeleton. Under surface smooth.

Air bladder and pyloric cæca absent, intestine short, stomach siphon-shaped, spermaries bilobate, liver on left side of body.

HALIEUTICHTHYS ACULEATUS, (MITCHILL), GOODE. (Figures 414 A, B.)

Lophius aculeatus, MITCHILL, American Monthly Magazine, II, 1818, 325 (specimen from Straits of Bahama).
Halieutichthys aculeatus, GOODE, Proc. U. S. Nat. Mus., II, 1879, 109 (calling attention to Mitchill's description), III, 467.—JORDAN and GILBERT, Bull. XVI, U. S. Nat. Mus., 851.—GOODE and BEAN, *ibid.*, 333 (specimen from Key West).—GILL, Proc. U. S. Nat. Mus., V, 556.
Halieutichthys reticulatus, POEY, MS.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 91 (specimen from Cuba).

A species of *Halieutichthys*, with cordiform disc, which is about as wide as long, its length more than two-thirds that of the body. Body covered above with stout conical spines with stellular bases, largest upon the trunk, upon which they are arranged in about two irregular longitudinal rows on each side of the dorsal; upon the disc they are placed above the principal bones of the skeleton, most abundant upon its cranial portion. A single row of stout spines, usually three-pointed, marks the outer margin of the disc, a particularly large one at each outer angle. Body entirely smooth below. Snout very short, obtuse. Bridge over the rostral cavity covered in front with a three-pointed spine, having on each side a simple spine. Short, stout, simple spines, upon each supraorbital margin, the front of which is immediately above and behind the cavity containing the nostrils. The vertex bears several similar spines. Many spines closely placed upon the humeral area. Numerous short tentacles upon the margin of the disc and on the sides of the trunk. The supraoral cavity is elliptical, small (horizontal diameter two-sevenths diameter of orbit), containing a well-developed, club-shaped, very perceptible tentacle. The width of the opening of the anterior nostril, which is in a short tube, is one-half that of the posterior nostril, which is not tubular. The width of the mouth is much less than the distance between the pupils and is equal to the diameter of the orbit.

The diameter of the orbit is contained 8½ times in distance from snout to base of caudal, 6 times in distance from snout to origin of soft dorsal, 6½ times in distance to origin of anal, 3 times in distance to base of ventrals, and 6 times in distance to angle between pectorals and trunk, 4⅔ times in distance from snout to gill opening, 6 in greatest width of disc, and nearly 2 in that of trunk. Width of interorbital area two-fifths diameter of orbit.

Dorsal fin with 4 or 5 rays, the longest (1st) equal to diameter of orbit. Anal fin inserted under third ray of the dorsal, with 4 rays, the third or longest, very slightly longer than the longest dorsal ray.

Ventral fins inserted nearly under the middle of the disc, with one rudimentary and 5 dorsal rays, increasing in length posteriorly, the last and longest contained 5 times in total length; distances between origins of ventrals 6½ in total length.

Pectorals with peduncles entirely included in common membrane, with blades far back, horizontal, lying close to trunk, composed of 16 rays, the middle or longest 3⅞ in total length.

Caudal fin, rounded, composed of 9 rays, the external rays, one above and two below, simple, the others bifid; length of middle ray equal to that of trunk (measured from junction of pectorals to base of caudal rays) and slightly exceeding the longest pectoral ray. Length of intestine contained 1⅔ times in total length.

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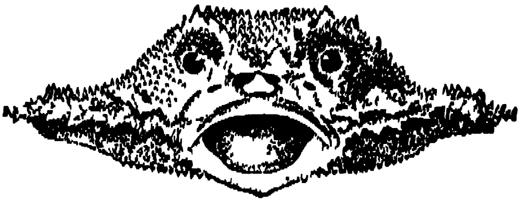
[1] The rostral tentacle in *Halieutichthys* is by no means obsolete, though it is said to be by all who have discussed the genus.

Radial formula: D. 4–5; A. 4; C. 9; P. 16; V. I, 5; B. 6; Gills 2½.

Color: Body covered above with reticulations of brown, the general hue varying from light yellowish gray to grayish brown, the markings being darker upon darker specimens. Pectorals and caudal fins with about three dark bars; the terminal bars in young very black. Body beneath, milky white.

Specimens of this species were obtained by the *Blake* from station CCLIX, in 24° 43′ N. lat., 83° 25′ W. lon., at a depth of 37 fathoms; and from station (VIII), off Granada, West Indies, at a depth of 92 fathoms. Also by the *Albatross* from station 2290, in 35° 23′ N. lat., 75° 24′ 30″ W. lon., at a depth of 9¾ fathoms; from stations 2121–2, between 10° 37′ 40″ N. lat., 61° 42′ 40″ W. lon., and 10° 37′ N. lat., 61° 44′ 22″ W. lon., at a depth of from 31 to 34 fathoms; from station 2311, in 32° 55′ N. lat., 77° 54′ W. lon., at a depth of 79 fathoms; from station 2318, in 24° 25′ 45″ N. lat., 81° 46′ 45″ W. lon., at a depth of 45 fathoms; from station 2388, in 29° 24′ 30″ N. lat., 88° 01′ W. lon., at a depth of 35 fathoms; from station 2362, in 22° 08′ 30″ N. lat., 86° 53′ 30″ W. lon., at a depth of 25 fathoms; from station 2404, in 28° 44′ N. lat., 85° 16′ W. lon., at a depth of 60 fathoms; from station 2405, in 28° 45′ N. lat., 85° 02′ W. lon., at a depth of 30 fathoms; from station 2407, in 28° 47′ 30″ N. lat., 84° 37′ W. lon., at a depth of 24 fathoms; from station 2409, in 27° 04′ N. lat., 83° 21′ 15″ W. lon., at a depth of 26 fathoms; from station 2411, in 26° 33′ 30″ N. lat., 83° 15′ 30″ W. lon., at a depth of 30 fathoms; from station 2417, in 33° 18′ 30″ N. lat., 77° 07′ W. lon., at a depth of 95 fathoms.



APPENDIX.

ADDITIONS AND CORRECTIONS.

Page 3: Under *Myxine australis.* Add to synonymy:

Myxine australis, GÜNTHER, Challenger Report, VI, 1880, 23.

Page 6: For the Key to the Squali, substitute the following, by Dr. Gill:

KEY TO THE DEEP-SEA FAMILIES OF ANARTHROUS SQUALI.

I. Anal fin lacking; vertebræ tectospondylic.
  A. No spines in front of dorsal fins.......SCYMNORHINIDÆ
  B. Each dorsal fin preceded by a spine.......SPINACIDÆ
II. Anal fin present; vertebræ asterospondylic.
  A. Dorsal fins two, without antecedent spines, the first above or behind the ventrals...SCYLLIORHINIDÆ
  B. Dorsal fins two, without spines, the first in advance of ventrals; caudal crescentic, with a keel on each side of its stem; gill openings enormous.......CETORHINIDÆ

Page 7: *Scymnus lichia.* Vinciguerra obtained three examples in the Gulf of Genoa, July 26, 1879, at a depth of about 600 meters (Crociere delle Violante, 21).

Page 8: *Somniosus microcephalus.* According to Günther, Ström and Collett, *Somniosus microcephalus* is found off the coasts of Norway at depths of 150 to 300 fathoms.

Page 9: *Paracentroscyllium ornatum*, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. VIII, fig. 2.

Page 10: *Etmopterus spinax.* Add to synonymy:

Spinax Gunneri, REINHARDT, Kon. Dansk. Vid. Selsk. Forh., 1824-27 (1828), p. XVI.

According to Ström, this form occurs off Norway at depths of from 70 to 300 fathoms [Kon. Norsk. Vid. Selsk. Skr., 1883, 45].

Vinciguerra obtained twenty-two specimens in the Gulf of Genoa, at about 600 meters, July 26, 1879 (Crociere delle Violante, 20).

Ström reports it from 70 to 300 fathoms in Trondhjems Fiord [Norsk. Vid. Selsk. Skrift., 1884, 44.]

Page 11: After *Centroscyllium* add:

PARACENTROSCYLLIUM, Alcock.

Paracentroscyllium, ALCOCK, Ann. and Mag. Nat. Hist., 1889, November, 379; Bathybial Fishes of the Bay of Bengal, 1890, 5.

Two dorsal fins, each with a strong spine. No anal fin. Mouth crescentic, with a direct oblique groove at each angle. Teeth equal in both jaws, minute, simple, monocuspid, straight. No membrana nictitans. Gill openings rather wide. Integument smooth.—*Alcock.*

Three specimens of the single species, *P. ornatum*, Alcock, *loc. cit.*, were found in the Bay of Bengal, "Swatch of No ground," 285 to 405 fathoms, by the *Investigator.*

Page 12: *Centrophorus.* For *Centrophorus granulosus* read *C. uyatus* (Rafinesque). Bellotti demonstrates that *Acanthias uyatus* (Raf.), M. & H. is the young of *Centrophorus granulosus*, and states the young and old are abundant about Nice.

The *Squalus uyatus* of Rafinesque was described from Sicily, where the fishermen of Palermo call it the Uyatu; *Centrophorus uyatus* should then be the name of this species.

A specimen was taken by Vinciguerra in the Gulf of Genoa, July, 1879, at a depth of 600 meters (Crociere delle Violante, 1883, 18).

Centrophorus foliaceus, Günther (Challenger Report, XXII, 5, Pl. II, fig. a) was from station 232, off Inosima, Japan, at a depth of 245 fathoms.

C. squamulosus, Günther (*loc. cit.*, Pl. II, fig. b) was from the same locality as the preceding.

Page 14: *Centroscymnus cœlolepis.* A female containing five fœtuses was taken at Nice in 1883 by the Gal Brothers, and is now in the museum at Florence (Bellotti, Appunti all' Opera del Dottor Emilio Moreau, Milan, 1891, 113; Moreau, Hist. Nat. Poiss., France, Suppl. 9). Another was taken a few days before.

These captures show that this shark is an inhabitant of the Mediterranean. It will probably be found abundant in 200 to 600 fathoms, especially in the western part of this sea.

Page 16: *Scylliorhinus retifer.* Add to synonymy:

Scylliorhinus retifer, Jordan and Gilbert, Bull. XVI, U. S. Nat. Mus., 869.

Scylliorhinus hispidus (Alcock) [Ann. and Mag. Nat. Hist., August, 1891, 21] was obtained by the *Investigator* in the Andaman Sea, station 115, 188 to 222 fathoms.

Scylliorhinus canescens (Günther) [Challenger Report, XXII, Pl. I, fig. a] was obtained by the *Challenger* at station 310, off the southwest coast of South America in 400 fathoms.

Scylliorhinus hispidus (*Scyllium hispidum*) Alcock, Ill. Zool. *Investigator*, Fishes, Pl. VIII, fig. 3.

Page 18: *Pseudotriacis microdon.* This species was first made known by Capello from a single specimen obtained at Setubal in 1867. None have since been recorded from Portugal (Peixes de Portugal, 1880, 44).

Page 20: *Pristiurus melanostomus.* Vinciguerra obtained sixty-six specimens, nearly all females, in the Gulf of Genoa, July 26, 1879, at a depth of about 600 meters (Crociere delle Violante, 18). The Rev. W. Spottswood Green obtained a young specimen at a depth of 150 fathoms off the southwest coast of Ireland in July, 1889 (Günther, Ann. and Mag. Nat. Hist., Dec., 1889, 415).

Page 24: *Chlamydoselachus anguineus.* Collett has recently announced the very surprising fact of the occurrence of this form at Madeira, where the Prince of Monaco obtained a young female, 610 millimeters long, in March, 1889, thus bringing this strange family and genus into the Atlantic (Collett, Bull. Soc. Zöol. France, 1890, 219).

Raia isotrachys (Challenger Report, XXII, 7, Pl. III) was from *Challenger* station 235, south of Japan, in 365 fathoms.

Page 25: *Raia lintea*, Fries. Collett reports that several individuals were taken at Jæderen's Rev, at about 100 fathoms depth, and that its northern limit is about N. lat. 59° (Christ. Vid. Selsk. Forh., 1882, No. 29, 4).

Raia mamillidens, Alcock (Ann. and Mag. Nat. Hist., November, 1889, 380; Ill. Zool. *Investigator*, Fishes, Pl. VIII, fig. 1), was taken by the *Investigator* in the Gulf of Manaar, N. lat. 6° 29′, E. lon. 79° 34′, at a depth of 597 fathoms.

Raia radiata. Collett reports this species along the entire length of the Norwegian coast to the Russian boundary, and that it is numerous in the fiords of Finmark. Its northern limit is the northwest coast of Spitzbergen, N. lat. 80°. The greatest depth at which it has been found is 450 fathoms (Collett, Christ. Vid. Selsk. Forh., 1882, No. 29, 3).

Page 27: *Raia circularis.* Collett reports that this species is found on the coast of Norway at depths of 100 to 300 fathoms, and that its northern limit is about N. lat. 59° (Christ. Vid. Selsk. Forh., 1882, No. 29, 4).

Raia senta, Garman, (Proc. U. S. Nat. Mus., VIII, 1885, p. 43), was taken on Le Have Banks, and is doubtless hemibathybial in its distribution.

Raia aleutica, Gilbert and Thoburn (Bull. U. S. Fish Com., 1894), was taken in 81 fathoms, south of Unalaska, and is also doubtless hemibathybial.

Raia trachura, Gilbert (Proc. U. S. Nat. Mus., 1891, p. 539), was taken in the Santa Barbara Channel in 822 fathoms.

Raia abyssicola, Gilbert and Thoburn (Bull. U. S. Fish Com., 1894), was taken off Queen Charlotte Islands, British Columbia, at a depth of 1,588 fathoms.

Page 28: *Raia hyperborea*. The Norwegian North Sea Expedition of 1878 took a specimen 15 miles northwest of Spitzbergen in 459 fathoms (Collett, Christ. Vid. Selsk., IV, 1878, 8).

Page 29: *Raia fullonica*. Collett reports this species from numerous localities between Jæderen's Rev and Trondhjem's Fiord, at a depth of 80 to 150 fathoms. Its northern limit is N. lat. 63° 45′ (Christ. Vid. Selsk. Forh., 1882, No. 29, 4).

Page 30: *Raia nidrosiensis*. Collett reports that since the discovery of this species at Trondhjem's Fiord, in 1880–'81, it has been frequently observed in the same locality at depths of 100 to 300 fathoms. Its northern limit is N. lat. 63° 45′ (Christ. Vid. Selsk. Forh., 1882, No. 29, 4).

Page 30: *Raia batis*. Collett reports that this species is common along the entire coast of Norway and the fiords of Finmark, and that it descends to a depth of 200 fathoms. Its northern limit is N. lat. 71° (Christ. Vid. Selsk. Forh., 1882, No. 29, 4).

Page 30: *Raia vomer*. Collett reports that many examples were taken at Jæderen's Rev, Bergen and Trondhjem Fiord, and that it is rare elsewhere in Norwegian waters. It is found in depths of 100 to 150 fathoms, and deeper. Its northern limit is N. lat. 63° 45′ (Christ. Vid. Selsk. Forh., 1882, No. 29, 4).

Family TRYGONIDÆ.

UROLOPHUS, M. & H.

Urolophus kaianus, Günther (Challenger Report, VI, 37; XXII, 12), was from *Challenger* station 192, off the Ki Islands, in 140 fathoms.

Urolophus Goodei, JORDAN and BOLLMAN (Proc. U. S. Nat. Mus., 1889, p. 151), taken in Magdalen Bay at a depth of 33 fathoms, is probably hemibathybial.

Page 31: *Chimæra monstrosa*. Add to synonymy:

Vaillant, Exp. Sci. Trav. et Tal., 80, Pl. IV, fig. 2.
Chimæra mediterraneus, RISSO, Hist. Nat. Eur. Merid., III, 1826, p. 68.

Specimens of this species were also taken by the *Travailleur* at station LXXXVI, off the coast of Soudan, in 800 meters; station XCV, on the Banc d'Arguin, in 1,230 meters; and station CXXVII, off the Azores, in 1,257 meters.

Vinciguerra obtained a specimen, July 26, 1879, in the Gulf of Genoa, at a depth of 600 meters (Crociere delle Violante, 1883, 23).

Capello has obtained several specimens in the markets of Lisbon (Peixes de Portugal, 1880, 43).

The Rev. Mr. Green obtained an egg capsule off the southwest coast of Ireland at a depth of 315 fathoms (Günther, Ann. and Mag. Nat. Hist., Dec., 1889, 415).

The discovery of this capsule confirms Dr. Günther in his opinion that those previously figured did not belong to *Chimæra*, but to *Callorhynchus*. It is to be hoped that Dr. Vaillant will publish a statement of the character of the fragments found by him in the Gulf of Gascony and their likeness to the one so well figured by Dr. Günther.

Chimæra affinis. A single specimen has been taken by the fishermen of Setubal, Portugal (Peixes de Portugal, 1880, 43).

Page 36: *Alepocephalus bicolor*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. IV, fig. 2, Calcutta, 1892.

Alepocephalus Blanfordii, Alcock (Ann. and Mag. Nat. Hist., November, 1892, 357), is a species described from a single male specimen, about 14 inches long, obtained by the *Investigator* at station 128, in the Gulf of Manaar, at a depth of 902 fathoms.

Alepocephalus edentulus, Alcock (*loc. cit.*, 358, Pl. XVIII, fig. 2), was described from a single specimen, an immature male, nearly 3 inches long, obtained by the *Investigator* at station 132, in the Bay of Bengal, at a depth of 475 fathoms.

For the second section of the genus, including *Alepocephalus Bairdii*, Jordan and Evermann propose the generic name *Mitchillina*.

Page 37: *Alepocephalus tenebrosus*, Gilbert (Proc. U. S. Nat. Mus., 1891, p. 546), was taken by the *Albatross* in 359 to 822 fathoms, in the Santa Barbara Channel, California.

Page 40: *Bathytroctes squamosus*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. V, fig. 1, Calcutta, 1892.

Page 41: *Bathytroctes.*

Page 43: *Bathytroctes microlepis*, described by Günther from the Atlantic, was reported by Alcock from the Indian Ocean. It should be noted, however, that the specimen studied by him was, as he himself says, "very badly mutilated and not unequivocally identifiable" (Ann. and Mag. Nat. Hist., December, 1889, 453).

Page 45: *Narcetes erimelas*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. IV, fig. 1, Calcutta, 1892.

Page 46: *Xenodermichthys nodulosus.* Add to synonymy:

Günther, Challenger Report, VI, Shore Fishes, 1880, 63.

Page 50: *Aulastomatomorpha phosphorops*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. V, fig. 2, Calcutta, 1892.

Page 52: *Argentina sialis* GILBERT, (Proc. U. S. N. M., 1890, p. 56) was obtained by the *Albatross* at station 3077, coast of California, in 58 fathoms.

After *Argentina* add:

LEUROGLOSSUS, GILBERT.

Leuroglossus, GILBERT, Proc. U. S. Nat. Mus., 1890, XIII, 57.

Ventrals nearly under middle of dorsal. Mandible with a few weak teeth or none. Premaxillaries toothless. A row of stronger teeth on vomer and front of palatines. Tongue toothless. Pyloric cæca 9.

Appearance of *Argentina*, but the snout shorter, the maxillary reaching front of eye, and the tongue toothless.

This genus is represented by the single species, *L. stilbius*, of which two specimens were obtained at *Albatross* stations 2997 and 2998, off Lower California, in 221 and 40 fathoms.

Page 53: *Nansenia* is a generic name proposed by Jordan and Evermann for *M. groenlandicum.*

Bathylagus pacificus, Gilbert. Two specimens were taken by the *Albatross* off the coast of Washington, at stations 3071 and 3074, in 685 and 877 fathoms (Proc. U. S. N. M., XIII, 1890, 55).

Page 58: *Bathysaurus ferox.* To the synonymy add:

Bathysaurus obtusirostris, VAILLANT, Exp. Sci. Trav. et Tal., 136, 386, Pl. X, fig. 2, Pl. XIV, fig. 3.

Page 59: *Harpodon squamosus*, Alcock, is fully described in the "Annals and Magazine of Natural History," August, 1891, p. 128.

Bathysaurus obtusirostris, Vaillant (Exp. Sci. *Travailleur* and *Talisman*), is supposed by him to be closely allied to *B. mollis* described by Günther, from the Pacific, basing his opinion upon the presence of an adipose dorsal fin in *B. mollis* and its absence in *B. ferox*. It is not impossible, however, that the supposed absence of this fin in the latter may be due to the mutilation of the few specimens in existence.

Page 60: *Chlorophthalmus chalybeius.* Examples of this species were obtained by the *Fish Hawk* in the following localities: Cat. No. 26092, U. S. N. M., from stations 876, 877, and 878, off Block Island, at a depth of 126 fathoms; Cat. No. 28995, U. S. N. M., from station 1043, in N. lat. 38° 39′, W. lon. 73° 11′, at a depth of 130 fathoms; Cat. No. 28976, U. S. N. M., from station 1038, in N. lat. 39° 58′, W. lon. 70° 06′, at a depth of 146 fathoms; and Cat. No. 31644, U. S. N. M., from station 1108, in N. lat. 40° 02′, W. lon. 70° 37′ 30″, at a depth of 101 fathoms. The *Albatross* also obtained specimens as follows: Cat. No. 43829, U. S. N. M., from station 2420, in N. lat. 37° 03′ 20″, W. lon. 74° 31′ 40″, at a depth of 104 fathoms; Cat. No. 43830, U. S. N. M., from station 2424, in N. lat. 36° 41′ 37″, W. lon. 74° 42′ 15″, at a depth of 85 fathoms; Cat. No. 43831, U. S. N. M., from station 2425, in N. lat. 36° 20′ 24″, W. lon. 74° 46′ 30″, at a depth of 119 fathoms; Cat. Nos. 43833 and 43834, U. S. N. M., from station 2536, in N. lat. 39° 56′ 15″, W. lon. 70° 47′ 30″, at a depth of 157 fathoms; and Cat. No. 43835, U. S. N. M., from station 2537, in N. lat. 39° 56′ 45″, W. lon. 70° 50′ 30″, a depth of 156 fathoms.

Page 61: *Chlorophthalmus gracilis*, Günther (Ann. and Mag. Nat. Hist., 1878, II, 182; Challenger Report, XXII, 194). Three specimens, 9½ inches long, were obtained by the *Challenger* at station 300, in the middle of the South Atlantic, in 1,375 fathoms; and a single specimen, 4 inches long, at station 335, off Juan Fernandez, in 1,425 fathoms. (*Günther, l. c.*)

Chlorophthalmus corniger, Alcock (Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 19, Pl. VI, fig. 5), near *C. productus*, was found in the Bay of Bengal, station 152, 145 to 250 fathoms.

Page 64: *Bathypterois Güntherii*, Alcock (Ann. and Mag. Nat. Hist., December, 1889, 450), was taken by the *Investigator* in the Andaman Sea, 7½ miles east of North Cinque Island, at a depth of 490 fathoms. Another specimen was obtained in the Bay of Bengal, *Investigator* station 112, in 561 fathoms (Ann. and Mag. Nat. Hist., August, 1891, 129).

A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VII, fig. 6, Calcutta, 1892.

Bathypterois insularum, Alcock (Ann. and Mag. Nat. Hist., November, 1892, 356), is a species described by Alcock from two adult females, 5½ inches long, with gravid ovaries, obtained by the *Investigator*, at station 121, in the Laccadive Sea, at a depth of 1,140 fathoms.

Page 66: Additional localities of *Bathypterois longipes*. U. S. N. M. No. 31801, lat. N. 39° 29′, lon. W. 72° 01′, *Fish Hawk*, taken September 8, 1882, in 291 fathoms; station 1143. U. S. N. M. No. 35635, 36° 05′ 30″ N., 69° 51′ 45″ W., station 2225, steamer *Albatross*, September 9, 1884, in 2,512 fathoms.

Page 71: *Myctophum pterotus*, Alcock (Ann. and Mag. Nat. Hist., September, 1890, 217; Ill. Zool. *Investigator*, Fishes, Pl. IX, fig. 3). This species, from the Bay of Bengal, is represented by about sixty specimens taken by the *Investigator* at station 96 off the Madras coast, at a depth of 98 to 102 fathoms. It is apparently somewhat similar to *M. remiger*, but has a longer anal fin and a smaller eye.

Page 72: *Myctophum opalinum* was obtained from the following localities: Station 2585, U. S. N. M. No. 43798, 39° 08′ 30″ N., 72° 17′ W., 542 fathoms, *Albatross*, September 19, 1885; station 2731, No. 43799, 36° 45′ N., 74° 28′ 30″ W., 781 fathoms, October 25, 1886; station 2719, No. 43800, 38° 29′ N., 71° 58′ W., 1,536 fathoms, September 19, 1886; station 2564, No. 43803, 39° 22′ N., 71° 23′ 30″ W., 1,390 fathoms, August 11, 1885; station 2685, No. 43804, 39° 35′ N., 71° 02′ 30″ W., July 17, 1886, 1,137 fathoms; station 2585, No. 43805, 39° 08′ 30″ N., 72° 17′ W., September 19, 1885, 542 fathoms; station 2727, No. 43807, 36° 35′ N., 74° 03′ 30″ W., October 24, 1886, 1,239 fathoms, 20 specimens; station 2742, No. 43808, 37° 46′ 30″ N., 73° 56′ 30″ W., September 17, 1887, 865 fathoms, 10 specimens (types); station 2522, No. 43809, 42° 20′ N., 65° 07′ 30″ W., July 12, 1885, 104 fathoms; station 2660, No. 44503, 28° 40′ N., 78° 46′ W., May 3, 1886, 504 fathoms, 9 very fine examples; station 2679, No. 44504, 32° 40′ N., 76° 40′ 30″ W., May 6, 1886, 782 fathoms (11 fine specimens, taken at surface by use of electric light).

A few other specimens were obtained by the steamer *Albatross*, in the same general locality and by the use of electric lights at stations 2655 and 2678.

Page 78: *Myctophum californiense*, Eigenmann (West American Scientist, November, 1889, p. 124), is thought by Jordan and Evermann to resemble the *Myctophum boops* of Richardson (*Scopelus boops*, Günther).

Scopelus arcticus, Lütken, spolia atlantica, scopeluii, 29, from Davis Straits, is placed by them in this genus.

Page 79: *Myctophum Townsendi*, Eigenmann, is pronounced by Jordan and Evermann to be closely allied to *Lampanyctus alatus*, though a distinct species.

Page 80: *Lampanyctus Warmingii* was found by Professor Warming in lat. 32° 6′ N., lon. 39° 28′ W.

Page 82: *Notoscopelus*. This genus was first described by Risso under the name *macrostoma*, which being virtually preoccupied in entomology in the form *Macrostomus*, we unhesitatingly reject.

Page 83: The *Macrostoma angustidens* of Risso (Hist. Nat. Eur. Merit., II, 448), although doubtless of this genus, can not, in our judgment, be identified at present with any species.

Notoscopelus quercinus. This species is very close to the *Scopelus elongatus* of Giglioli and Rafaelle, which can not be far away from that of Costa. We are disposed to believe with Bellotti (Atti Soc. Ital. Soc. Nat., Milan, 1892, 32; Note al Manuale d'Ittiologia Francese del Dott. Emilio Moreau, 16) that the *Scopelus pseudocrocodilus* of Moreau (Hist. Nat. Poiss. France, Supp., 1891, 84; Manuel d'Ichthyologie Française, 1895, 546) is identical with Costa's *S. elongatus*.

Page 88: *Collettia nocturna*. Jordan and Evermann decide that *Myctophum nocturnum*, Poey (Memorias, Hist. Nat. Cuba, II, 426), probably belongs to the genus *Collettia*.

Page 89: *Myctophum crenulare*. Jordan and Evermann (Proc. U. S. N. M., 1880, 274), from off Santa Barbara, is now placed by Jordan in the genus *Tarletonbeania*.

Diaphus engraulis, Günther. Two specimens, identified by Alcock with this species, were taken by the *Investigator* in the Bay of Bengal at station 115, in 188 to 220 fathoms (Ann. and Mag. Nat. Hist., August, 1891, 129). Jordan and Evermann refer *Scopelus cœruleus*, Klunzinger, to the genus *Diaphus*, and make *Myctophum protoculus*, Gilbert (Proc. U. S. N. M., 1890, 52), from *Albatross*, station 3072, 584 fathoms, off Washington, a synonym of *Diaphus theta*.

Page 91: *Rhinoscopelus rarus* was found by Lütken's correspondents in the Atlantic in the following localities: (1) Lat. 20° N., lon. 48°–50° W.; (2) lat. 34° 50′ S., lon., 4° 30′ W.; (3) lat. 37° 40′ S, lon. 12° E.; (4) lat. 33° N. (?)

Scopelus antarcticus, Günther, is figured in Challenger Report, XXII, Pl. LI, Fig. D. It is perhaps a *Rhinoscopelus*.

Page 92: *Scopelus pyrsobolus*, Alcock (*Scopelus pyrsobolus*, ALCOCK, Ann. and Mag. Nat. Hist., September, 1890, 218, Pl. VIII, fig. 3, outline). This form was obtained by the *Investigator* off the Madras coast at a depth of 690–920 fathoms. It is impossible to tell to what generic or subgeneric group it belongs, the most important characters having been obliterated before it was studied, but it would seem to resemble in a general way *Lampadena*.

Page 93: *Neoscopelus macrolepidotus*. Add to synonymy:

Vaillant, Exp. Sci. Trav. et Tal., 119, Pl. IX, figs. 2, 2a, 2b.

According to President Jordan, *Stenobrachius* of Eigenmann is a synonym of *Nannobrachium*, though having the dorsal ending over the third or fourth anal ray, and *S. leucopsarum* is a *Nannobrachium* as well as *N. mexicanum*, Gilbert (Proc. U. S. Nat. Mus., 1890, 51), from off the coast of southern California, and *N. regale*, Gilbert (Proc. U. S. Nat. Mus., 1891, 544), from the Santa Barbara Channel, California.

Scopelengys tristis, Alcock (Ill. Zool. *Investigator*, Fishes, Pl. VII, fig. 7, Calcutta, 1892) is not a member of the *Myctophidæ*, but apparently has affinities with the *Aulopidæ*.

Page 94: *Myctophum leucopsarum*, Eigenmann (Proc. Cal. Acad. Sci., 1890, 5), taken off Point Loma, Lower California, in stomachs of *Sebastodes*, is pronounced by Jordan, who has seen this type, to belong to *Nannobrachium*. Other species of this genus are that described by Gilbert under the name *Myctophum nannochir*, from *Albatross* station 3072, off the coast of Washington, and since found at various points, from the Santa Barbara Islands to Alaska, *Myctophum mexicanum*, Gilbert (Proc. U. S. N. M., 1890, 51), from *Albatross* stations 3008, 3009, off Lower California, and *M. regale*, Gilbert, from the *Albatross* collections in Santa Barbara Channel in 600 to 820 fathoms.

Page 95: The following new arrangement of *Maurolocidæ* will be proposed by Jordan and Evermann in their new Manual of the Fishes of North America.

a. Gill rakers very short; dorsal fin on hinder half of body.

  b. Dorsal fin well forward, its last ray inserted nearly over the first of anal; luminous spots over and behind anal forming a nearly continuous series.

    c. Luminous spots appearing as impressions on the skin, not placed on black globular bodies; anal rays 25 to 30; double row of spots behind pectorals ceasing at ventrals.......... MAUROLICUS.

    cc. Luminous spots occurring as "convex pearls, each sitting on a black globular body;" anal rays about 14; double row of spots behind pectorals reaching anal........ VINCIGUERRIA, new genus.

  bb. Dorsal fin farther back, nearly opposite anal, its first ray nearly over the front of anal; luminous spots over and behind anal gathered in 5 clusters of 2 to 4 each, the spots on a black background; star-shaped pigment spots along lateral line; anal rays about 24.

VALENCIENNELLUS, new genus.

VINCIGUERRIA, Jordan & Evermann.

This genus is close to *Maurolicus*, from which it differs, according to Lütken, chiefly in the character of its luminous spots which are pearl-like and placed on black globular bodies. Anal short, of 14 rays. (Named for Dr. Decio Vinciguerra, director of the Acquario Romano, and one of the most active and scholarly of the naturalists of Italy.)

VINCIGUERRIA ATTENUATA (Cocco) Jordan & Evermann.

Maurolicus attenuatus, Cocco, Lett. su. Salmon., 33, 1838, coast of Italy; GÜNTHER, Cat., v, 390, 1864; LÜTKEN, Spolia Atlantica, 271, 1892.

Scopelus tenorei, CUVIER & VALENCIENNES, Hist. Nat. Poiss., XXII, 440, 1849; after Cocco.

Head $3\frac{3}{4}$; depth 6. D. 12; A. 14. Last ray of dorsal just behind vertical from origin of anal. Luminous spots slightly prominent, "appearing as convex pearls, each sitting on a black globular body;" 12 to 14 pairs of spots between front of anal and base of caudal; upper row from gill opening to ventrals with 12, 11 between ventrals and anal; from tip of isthmus to anal, 7+16+10=33 spots. Length 2 inches. Open Atlantic, west to the Bahamas; in deep water. (Lütken, etc.)

VALENCIENNELLUS, Jordan & Evermann.

This genus is close to *Maurolicus* but with the dorsal fin farther back, opposite anal, its first ray nearly over front of anal. Photophores above anal gathered in about five clusters, each on a black background; anal fin long. Deep sea. (Named for Achille Valenciennes, the associate of Cuvier, author of the greater part of the "Histoire Naturelle des Poissons," a noble work which is the foundation of modern ichthyology.)

VALENCIENNELLUS TRIPUNCTULATUS (Esmark) Jordan & Evermann.

Maurolicus tripunctulatus, ESMARK, Christiania Vid. Selsk., Forh., 488, 1870, Madagascar; LÜTKEN, Spolia Atlantica, Scopelini, 49, 1892.

Head $3\frac{3}{4}$; depth $3\frac{3}{4}$. D. 9 or 10; A. about 24. Luminous spots arranged in and placed on black bodies, 16 pairs in the lower row from pectorals to ventrals; 5 between ventrals and anal; 5 black areas between vent and caudal about equidistant, and each one with 2 or 4 small luminous spots set close together (the first 3 with 3 each, the fourth with 2, and the last with 4); 1 spot on preopercle, 4 near shoulder girdle; 5 in an upper row behind pectoral; head and region along lateral line with a row of about 16 black pigment spots, some of them star-shaped, with many radiations, these largest posteriorly; large and small ones interspersed. First ray of dorsal slightly before first of anal. Two specimens known, one from Madagascar and one from Denmark Straits, between Greenland and Iceland.

For *Opisthoproctus soleatus* see figures and description in Vaillant. We have seen the specimen, but it is incomprehensible to us.

Page 96: *Chauliodus.* Insert *C. Macouni*, Bean (Proc. U. S. N. M., XIII, 1890, 44), described from a single specimen, obtained at *Albatross* station 2860, off Cape St. James, Queen Charlotte Islands, at a depth of 876 fathoms.

C. Schneideri (= *C. Sloani*) was said by Risso to have been taken in *moyennes profondeurs* off Nice, but its Mediterranean habitat is probably in not less than 300 fathoms. The type of the species, originally described by Mark Catesby, the Virginia naturalist, under the name of *Vipera marina*, was obtained at Gibraltar.

Page 99: *Cyclothone microdon.* Examples of this species were taken by the *Blake* in the following localities: Station CXXXIX, off Caya de Moa, in 1,554 fathoms; station CXLIV, off Barbadoes, in 237 fathoms; station CL, off Martinique, in 476 fathoms; station CLIV, off Santa Cruz, in 580 fathoms; station CLVI, off Montserrat, in 88 fathoms; station CLVIII, off Martinique, in 565 fathoms; station CLIX, off Dominica, in 333 fathoms; station CLXXXIX, in N. lat. 24° 36′, W. lon. 84° 05′, in 955 fathoms; stations CCXX and CCLXV in the same locality; station CCXII, off Corysfort Reef, in 320 fathoms; and station CCXIX, in N. lat. 24° 33′, W. lon. 84° 05′, at a depth of 968 fathoms.

The *Fish Hawk* obtained specimens as follows: From station 953, in N. lat. 39° 52′ 30″, W. lon. 70° 17′ 30″, at a depth of 724 fathoms; station 954, in N. lat. 39° 53′ 00″, W. lon. 70° 18′ 30″, at a depth of 651 fathoms; station 994, in N. lat. 39° 40′, W. lon. 71° 30′, at a depth of 368 fathoms; station 997, in N. lat. 39° 42′, W. lon. 71° 32′, at a depth of 335 fathoms; station 998, in N. lat. 39° 43′, W. lon. 71° 32′, at a depth of 302 fathoms; and station 1096, off Martha's Vineyard.

Specimens were secured by the *Albatross* in the following localities: Station 2001, in N. lat. 37° 46′ 30″, W. lon. 74° 00′ 00″, at a depth of 519 fathoms; station 2034, in N. lat. 39° 27′ 10″, W. lon. 69° 56′ 20″, at a depth of 1,346 fathoms; station 2035, in N. lat. 39° 26′ 16″, W. lon. 70° 02′ 37″, at a depth of 1,362 fathoms; station 2036, in N. lat. 38° 52′ 40″, W. lon. 69° 24′ 40″, at a depth of 1,735 fathoms; station 2040, in N. lat. 38° 35′ 13″, W. lon. 68° 16′ 00″, at a depth of 2,226 fathoms; station 2044, in N. lat. 40° 00′ 30″, W. lon. 68° 37′ 20″, at a depth of 1,067 fathoms; station 2045, in N. lat. 40° 04′ 20″, W. lon. 68° 43′ 50″, at a depth of 373 fathoms; station 2047, in N. lat. 40° 02′ 30″, W. lon. 68° 48′ 40″, at a depth of 389 fathoms; station 2083, in N. lat. 40° 26′ 40″, W. lon. 67° 05′ 15″, at a depth of 959 fathoms; station 2095, in N. lat. 39° 29′ 00″, W. lon. 70° 58′ 40″, at a depth of 1,342 fathoms; station 2097, in N. lat. 37° 56′ 20″, W. lon. 70° 57′ 30″, at a depth of 1,917 fathoms; station 2098, in N. lat. 37° 40′ 30″, W. lon. 70° 37′ 30″, at a depth of 2,221 fathoms; station 2103, in N. lat. 38° 47′ 20″, W. lon. 72° 37′ 00″, at a depth of 1,091 fathoms; station 2106, in N. lat. 37° 41′ 20″, W. lon. 73° 03′ 20″, at a depth of 1,497 fathoms; station 2116, in N. lat. 35° 45′ 23″, W. lon. 74° 31′ 25″, at a depth of 888 fathoms; station 2117, in N. lat. 15° 24′ 40″, W. lon. 63° 31′ 30″, at a depth of 683 fathoms; station 2118, in N. lat. 13° 32′ 40″, W. lon. 62° 54′ 00″, at a depth of 690 fathoms; station 2190, in N. lat. 39° 40′ 00″, W. lon. 70° 20′ 15″, at a depth of 1,180 fathoms; station 2209, in N. lat. 39° 34′ 45″, W. lon. 71° 31′ 30″, at a depth of 1,080 fathoms; station 2223, in N. lat. 37° 48′ 30″, W. lon. 69° 43′ 30″, at a depth of 2,516 fathoms; station 2226, in N. lat. 37° 00′ 00″, W. lon. 71° 54′ 00″, at a depth of 2,045 fathoms; station 2352, in N. lat. 22° 35′ 00″, W. lon. 84° 23′ 00″, at a depth of 463 fathoms; station 2382, in N. lat. 28° 19′ 45″, W. lon. 88° 01′ 30″, at a depth of 1,255 fathoms; station 2427, in N. lat. 42° 46′ 00″, W. lon. 51′ 00′ 00″, at a depth of 523 fathoms; station 2534, in N. lat. 40° 01′ 00″, W. lon. 67° 29′ 15″, at a depth of 1,234 fathoms; station 2550, in N. lat. 39° 44′ 30″, W. lon. 70° 30′ 45″, at a depth of 1,081 fathoms; station 2553, in N. lat. 39° 48′ 00″, W. lon. 70° 36′ 00″, at a depth of 551 fathoms; station 2562, in N. lat. 39° 15′ 30″, W. lon. 71° 25′ 00″, at a depth of 1,434 fathoms; station 2565, in N. lat. 38° 19′ 20″, W. lon. 69° 02′ 30″, at a depth of 2,069 fathoms; station 2568, in N. lat. 39° 15′ 00″, W. lon. 68° 08′ 00″, at a depth of 1,781 fathoms; and station 2571, in N. lat. 40° 09′ 30″, W. lon. 67° 09′ 00″, at a depth of 1,356 fathoms.

MANDUCUS, Goode and Bean, n. g.

Page 104: After *Photichthys* add: The species described by Johnson under the name *Gonostoma maderense* (Proc. Zool. Soc., 1890, 458) does not belong to the genus *Gonostoma* as limited by us, although apparently a member of the family *Gonostomidæ*. Its relations are most nearly with *Photichthys*, having as it does the dorsal fin placed in the middle of the back over the space between the ventral and the anal. It is, however, distinguished from *Photichthys* by the absence of the adipose fin and scales upon the back, and by the presence of scales upon the cheek and also by the absence of fangs upon the vomer, and the presence of a double row of teeth in the anterior portion of the lower jaw.

Rather than assign an Atlantic species to a genus only known from the South Pacific it seems justifiable to provisionally form a new genus for its reception, it being in our judgment safer to overestimate diagnostic characters which are supposed to exist rather than to undervalue them and withdraw attention from them by the opposite course.

We therefore propose for this form the generic name *Manducus*, characterized as follows: Body oblong, compressed, covered with scales except upon the top of the head and upon the ridge of the back, which is rugosely warted; two rows of spots on each side of the belly close to the ventral line. Head elongate, conical, much compressed, with thin bones; the cheeks covered with large scales. Opercular bones thin, the mouth and gill openings very wide. Under jaw for the most part included, armed with a single row of sharp conical teeth with small ones between them and a double row of eight smaller, but similar ones in front. Upper jaw with a single row of teeth in front similar to those in the lower jaw, followed on either side by a few very long teeth with others smaller behind. Vomer with a few teeth; a row of minute sharp teeth on the palatines, and a row of teeth on the entopterygoids as well as a small similar patch on the upper side of the tongue. Eye moderate. Dorsal in the middle of the back over the space between the ventral and the anal. Pectoral and ventral well developed, the latter narrow and shorter than the pectoral. Anal lower than dorsal with longer base. Lateral line much as in *Gonostoma*.

MANDUCUS MADERENSIS (JOHNSON).

Diagnosis: A fish having the body elongate, compressed; its height is included 6⅛ times in its length without the caudal; the length of the head 5½ times in the same distance. The top of the head is scaleless, armed with two low converging ridges which meet in front of the orbits Cheeks with large scales; profile rather steep and snout short. The eye, which is round, does not reach the profile; its diameter is included about 5 times in the length of the head, its distance from the snout is rather more than its own diameter, and from the jaw rather less.

The lateral line begins near the edge of the operele, ⅓ of the height from the outline of the back, and following gently until it reaches the middle of the height under the dorsal, it then runs straight to the base of the caudal. Two rows of photophores, which are silvery or pale steel blue in color, are closely set low down on each side of the belly. The upper row, on which between 60 and 70 spots may be counted, begins at the throat and is continued to the base of the caudal, and the lower row runs along the isthmus between the gill openings and likewise extends to the caudal.

Radial formula: D. 11; P. 10; V. 8; A. 33; C. III+19+III.

Scales undetermined.

This species is known from a single specimen obtained by Johnson in the market at Funchal and is now at the British Museum.

Color blackish, with two rows of silvery or pale blue spots along each side of the belly.

Page 105: *Astronesthes niger*. Add to synonymy:

GÜNTHER, Challenger Report, XXXI, Pt. II, 38.

Page 108: *Stomias nebulosus*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VII, fig. 1, Calcutta, 1892.

Page 118: *Caulopus borealis*, GILL (Proc. Acad. Nat. Sci. Phila., 1862, 128), occurs in the Northeast Pacific.

Caulopus serra, Gill (*l. c.*), is known only from a single specimen taken off Monterey, Lower California.

Paralepis. In the study of this genus, special attention should be given to the important paper by Cristoforo Bellotti, entitled "I Paralepidini del Mediterraneo," in the Atti della Società Italiana di Sci. Nat., XX, fasc. 1, 1877; and his remarks in the same journal, XXXIV, 1892, 34.

KEY TO THE MEDITERRANEAN SPECIES OF PARALEPIS.

(After Bellotti.)

Rays in front dorsal, 10.
  Anal rays, 30.
    Ventrals in advance of dorsal. Caudal peduncle rather long.............P. SPHYRÆNOIDES, Risso.
    Ventrals inserted behind middle of front dorsal. Caudal peduncle very short.
P. CUVIERI, Bonaparte — (P. COREGONOIDES, C. & V.).
  Anal rays, 22-3.
    Ventrals slightly in advance of dorsal..................................P. SPECIOSUS, Bellotti.
    Ventrals inserted under third ray of front dorsal........................P. COREGONOIDES, Risso.
Rays in front dorsal, 13.
  Anal rays, 22.
    Ventrals in advance of dorsal..P. HYALINUS, Raf.
(See Bellotti, Atti Soc. It. Sci. Nat., Milan, April 20, 1877, May 30, 1891, May 22, 1892.)

The following account of the genus *Arctozenus*, Gill, will occur in Jordan and Evermann's new manual.

ARCTOZENUS, Gill.

s, GILL, Proc. Ac. Nat. Sci. Phila., 1864, 188.

Head elongate, conical, the snout attenuate, the jaws straight, the lower mostly covered by the upper; teeth of lower jaw anteriorly slender, recurved, and distant; posteriorly small, acute, and close together. This genus is closely related to *Sudis*, from which it differs mainly in the absence of fang-like teeth. From *Paralepis* it differs in the position of the ventral fins, which are entirely behind the dorsal. The known species belong to the deep waters of Arctic America; long, slender fishes suggesting the Barracuda in outline. (*ἄρκτος*, northern; *ξένος*, strange.)

a. Teeth comparatively strong; Atlantic species...A. BOREALIS.
aa. Teeth comparatively weak; Pacific species..A. CORUSCANS.

A. coruscans was described by Jordan and Gilbert, in 1880 (Proc. U. S. N. M., 411), from off Port Townsend, Washington.

Page 120: *Paralepis intermedius*, Poey, is referred to *Sudis*.

Odontostomus atratus, Alcock (Journ. Asiatic Soc. of Bengal, LXII, Part II, No. 4, 1883, p. 14, Pl. IX, fig. 4), was obtained from 128 fathoms in the Bay of Bengal.

Page 128: *Polyipnus spinosus*. The locality of the specimen assigned by Alcock to this species was *Investigator* station 115, and the range of depth was 108 to 220 fathoms—not 240, as stated in the text.

Idiacanthus antrostomus, Gilbert, was obtained by the *Albatross* in 603 fathoms at station 2980, off the coast of southern California (Proc. U. S. N. M., XIII, 1890, 54).

Page 129: *Halosaurus parvipinnis*, Alcock (*Halosaurus parvipinnis*, Alcock, Ann. and Mag. Nat. Hist., November, 1892, 362).

This species, represented by a single female, about 15 inches long, with gravid ovaries, taken by the *Investigator* at station 122, Laccadive Sea, 865 to 880 fathoms, has the scales of the lateral line but little larger than those of the rest of the body, and probably belongs to the restricted genus *Halosaurus*.

Page 134: *Aldrovandia mediorostris* (Günther) [Challenger Report, XXII, 239, Pl. LIX, fig. C]. A single specimen, 17½ inches long, was obtained by the *Challenger* at station 207, west of the Philippine Islands, at a depth of 700 fathoms.

Page 132: *Aldrovandia affinis* (Günther, Ann. and Mag. Nat. Hist., 1877, 444; Challenger Report, XXII, 241, Pl. LIX, fig. b: Alcock, *op. cit.*, October, 1890, 309) is recorded from south of Japan, 565 fathoms, and the Arabian Sea, 1,000 fathoms.

A. Hoskynii, Alcock, *loc. cit.*, is closely allied to, if not identical with, the preceding, and was obtained from 1,000 fathoms in the Arabian Sea. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VII, fig. 3, Calcutta, 1892.

Aldrovandia anguilliformis (*Holosaurus anguilliformis*, Alcock, Ann. and Mag. Nat. Hist., December, 1889, 453) was obtained by the *Investigator* in the Gulf of Manaar at a depth of 675 fathoms.

Page 134: *Aldrovandia mediorostris* (Günther) was obtained in 1894 by the *Investigator* at station 150 in the Laccadive Sea, in 719 fathoms (Alcock, Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 22).

Page 136: *Halosaurichthys carinicauda*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VII, figs. 2, 2a, Calcutta, 1892.

Page 138: *Congermuræna longicauda*. In addition to the locality cited, the *Investigator* obtained this form at station 120, in the Bay of Bengal, at a depth of 240 to 270 fathoms.

Alcock states that *Congermuræna longicauda* "seems to be characteristic of the Bay of Bengal between 200 and 300 fathoms" (Ann. and Mag. Nat. Hist., November, 1892, 362).

A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VII, fig. 5, Calcutta, 1892.

Congermuræna nasica, Alcock (Journ. Asiatic Soc. of Bengal, LXIII, Part II, 1893, p. 15; Ill. Zool. *Investigator*, Fishes, Pl. IX, fig. 2, 1894).

Congermuræna musteliceps (*Congermuræna musteliceps*, Alcock, Journ. Asiatic Soc. of Bengal, LXIII, Part II, No. 2, 1894, p. 19, Pl. VII, fig. 5) occurs in the Bay of Bengal, station 112, in 165 to 250 fathoms.

Congermuræna squaliceps, Alcock (Journ. Asiatic Soc. of Bengal, Part II, No. 4, 1883), a species allied to *C. megastoma*, was obtained in the Bay of Bengal in 128 fathoms, as was also *C. nasica*, Alcock.

Leptocephalus vulgaris. Many individuals were taken by Vinciguerra in the Gulf of Genoa, July 26, 1879, at a depth of about 600 meters (Crociere delle Violante, 120).

Uroconger vicinus, Alcock. Alcock identifies with this species a large female, 25 inches long, with gravid ovaries, taken by the *Investigator* at station 132, in the Bay of Bengal, at a depth of 475 fathoms (Ann. and Mag. Nat. Hist., November, 1892, 363).

Page 139: *Coloconger raniceps*, Alcock. Alcock states that this species seems to be characteristic of the Bay of Bengal between 200 and 400 fathoms, occurring in almost every haul (Ann. and Mag. Nat. Hist., November, 1892, 364).

A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VII, fig. 4, Calcutta, 1892.

Promyllantor purpureus, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VI, fig. 2, Calcutta, 1892.

Page 143: *Synaphobranchus pinnatus*. Add to synonymy:

GÜNTHER, Challenger Report, VI, Shore Fishes, 1880, 63.

Page 145: Size of *Histiobranchus infernalis*. Type, 33279, 18½ inches or 470 millimeters long; 44324, station 2669, *Albatross*, 11¼ inches or 286 millimeters; 38205, station 2727, *Albatross*, 31½ inches or 800 millimeters.

Page 146: *Sauromurænesox vorax*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VI, fig. 3, Calcutta, 1892.

Xenomystax trucidens, Alcock (Journ. Asiatic Society of Bengal, LXIII, Part II., No. 2, p. 20), found by the *Investigator* in the Laccadive Sea, station 150, 719 fathoms, is closely allied to *X. atrarius*, Gilbert.

Page 149: *Nettastoma melanurum*. A single individual was taken by Vinciguerra with long lines in the Gulf of Genoa, July 26, 1879, at a depth of about 600 meters (Crociere delle Violante, 121).

Page 156: *Garialiceps microps*, Alcock (Ann. and Mag. Nat. Hist., November 1892, 364), gives additional notes upon two specimens, 13 and 15 inches long, obtained by the *Investigator* in the Laccadive Sea, station 126, 1,370 fathoms, and in the Gulf of Manaar, station 128, 102 fathoms. He suggests that this species is perhaps identical with that described by Vaillant under the name *Nemichthys infans;* in other words, the species discussed by us under the name of *Serrivomer Richardii* (see p. 155). This opinion is, of course, simply by way of suggestion.

The form referred by Wood-Mason to the genus *Garialiceps*, under the name *G. tæniola*, is referred by Alcock to the genus *Nettastoma*. After a study of numerous sexually immature males and females, nearly 2 feet in length, and several young ones, from *Investigator* station 120, Bay of Bengal, 120 to 76 fathoms, Alcock states that the species was originally described from immature individuals, and was included with *Gavialiceps microps* in a new genus. The investigation of full-grown individuals shows that this species has no place in the genus *Gavialiceps*, which is a true Nemichthyine form without fins, but that it ought to be ranked with *Nettastoma* (Alcock, Ann. and Mag. Nat. Hist., 1891, 136).

Page 158: *Investigator*, Goode, new genus. A genus of *Nemichthyidæ* apparently allied to the *Spinivomerinæ* and to the genus *Serrivomer*, the jaws being moderate and the length of the snout little more than half that of the head. "The gill openings, which are wide, are separated from one another only by a thin fold of the skin," as in *Spinivomerinæ*. "Small recurved asperities in crowded bands form the dentitions of the jaws and vomer." A long series of stout, sharp, close-set spines like those of *Notacanthus* occupying the middle third of the dorsal fin. Pores of lateral line arranged in quincunces. Type, *Investigator acanthonotus* (Alcock). (Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 22), which was found by the *Investigator* in the Bay of Bengal, station 165, in 475 fathoms.

Page 159: *Eurypharynx pelecanoides*. Three specimens were taken by the French Expedition off the coast of Morocco, in depths of 1,050, 1,400, and 2,300 meters.

Page 160: *Dysomma bucephalus*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. VI, fig. 1, Calcutta, 1892.

Page 167: Second paragraph. Risso said "neuf rayons," which makes the whole occurrence still more incomprehensible.

Page 176: *Beryx splendens*. Add to synonymy:

GÜNTHER, Challenger Report, VI, Shore Fishes, 3.

Beryx decadactylus. A stray specimen was taken at Nice in July, 1885, and is now in Giglioli's collection in Florence. This would indicate that this species is becoming a member of the deep-sea fauna of the Mediterranean.

Page 178: *Plectromus* (?) *microps* (*Melamphaës microps*, Günther, Challenger Report, XXII, 26) was obtained by the *Challenger* at station 146, between the Cape of Good Hope and Kerguelen Island, at a depth of 1,375 fathoms.

Page 179: *Plectromus cristiceps* (= *Melamphaës cristiceps*, Gilbert). A specimen, 5 inches long, was obtained from *Albatross* station 3075, off the coast of Oregon and Washington, at a depth of 859 fathoms (Proc. U. S. N. M., XIII, 1890, 60).

Plectromus lugubris (= *Melamphaës lugubris*, Gilbert) was obtained by the *Albatross* at station 2923, off southern California, at a depth of 832 fathoms. It is evidently a *Plectromus* rather than *Melamphaës*, having the dorsal overlapping the anal, and having three spines in the dorsal (Gilbert, Proc. U. S. N. M., XIII, 1890, 60).

Page 189: *Trachichthys Traillii*, Hutton (Ann. and Mag. Nat. Hist., 1875, XVI, 315; Trans. New Zeal. Inst., VIII, 212.—Arthur, Trans. New Zeal. Inst., 1885, XVII, 162, Pl. XIV, fig. 2.—Günther, Challenger Report, XXII, 23). A specimen, 7½ inches long, was found dead and floating on the surface of the water near Stewart Island; a second of the same length was caught in Otago Harbor, September 6, 1884; and a third smaller one since that date.

Trachichthys fernandezianus, Günther (Challenger Report, XXII, 23). Two specimens, preserved in a dry state, were contained in the series of Chilean fish presented by the Chilean Government to the British Museum. They were stated to have been captured at Juan Fernandez, and are 5 inches long.

Trachichthys jacksoniensis (Castelnau), Macleay (*Trachichthys australis*, Castelnau, Proc. Linn. Soc. N. S. W., 1879, III, 364. *Trachichthys jacksoniensis*, Macleay, *op. cit.* V, 511.—Günther, Challenger Report, XXII, 22). A single specimen, 5½ inches long, was found in Port Jackson on the 19th of September, 1877.

Trachichthys australis, Shaw (Nat. Misc., 378.—Günther, Cat. Fish. Brit. Mus., I, 10; Challenger Report, XXII, 22). "Besides the dry typical specimen," says Günther, "I have seen only one other, 2 inches long, which also is stated to have come from Australia."

Trachichthys intermedius, Hector (Trans. New Zeal. Inst., VII, 245, Pl. XI, fig. 18A.—Günther, Challenger Report, XXII, 24). Two specimens were collected by the Challenger Expedition—one 3⅛ inches long, on the east coast of New Zealand, at station 166, in 275 fathoms.

The specimen described by Dr. Hector was only 2.7 inches long, and was obtained off Cape Farewell in 400 fathoms.

Hoplostethus mediterraneus. The range of this species, not hitherto known north of Madeira, has been extended to the coast of Great Britain by the Rev. Mr. Green, who obtained a specimen in the summer of 1889 off the southwest coast of Ireland (Günther, Ann. and Mag. Nat. Hist., December, 1889, 417).

The range of this form in the Mediterranean seems to be limited on the east by Malta (Gulia, Tentam., Ichth. Meliteus., 1861, 22). It was recorded by Guichenot and Bourgeot from Algeria, and is also known from the Gulf of Naples (Costa) and the Gulf of Palermo (Dœderlein), who records it also from Messina, where it is called "Bulicaru."

Its range in the western Atlantic is from 11° 43′ to 39° 50′ N. lat.; in the eastern Atlantic from 36° to 50°.

A specimen was taken in the Bay of Bengal at *Investigator* station 162, at a depth of 145 to 250 fathoms.—Alcock, Journ. Asiatic Soc. of Bengal, LXIII, Part II, No. 2, 1894, p. 2.

We are disposed to recognize the *Hoplostethus japonicus* of Hilgendorf as a distinct species, until the differences recorded by Hilgendorf and Günther can be studied from a larger series of specimens.

Page 195: Jordan and Evermann propose the new generic name *Escolar* for *Thyrsitops violaceus*, Bean. They also are of the opinion that *Thyrsites niger*, Poey (enumerated Pisc., Cubens, 1875, p. 74), is of the same species. Since this was described from a fragment, we have not taken it into consideration in our studies.

Page 201: Jordan and Evermann refer our *Dicrotus parvipinnis* to *Promethichthys*, though with some doubt as to the propriety of so doing.

Promethichthys bengalensis (Alcock, *Thyrsites bengalensis*, Journ. Asiatic Soc. of Bengal, LXIII, Part II, No. 2, 1894, p. 3), a species allied to *P. prometheoides*, Bleeker, was obtained by the *Investigator* at station 162, in the Bay of Bengal, 115 to 250 fathoms.

Page 203: *Lepidopus lusitanicus*, Shaw (*L. caudatus*), occurs, says Capello, in great abundance off the coast of Portugal, where it is taken in the open sea in March and April (Peixes de Portugal, 1880, 16).

The specific identity of the fish found at St. Lucas by Xantus is so doubtful that we prefer to refer to it as *L. Xantusi*, new specific name.

Page 208: *Trichiurus lepturus*, the *Peixe espada lomo*, is very abundant off the coast of Portugal, where it is taken with the deep-sea lines used for sharks (Capello, Peixes de Portugal, 1880, 16).

Page 221: *Diretmus argenteus* is referred to by Vaillant, pp. 18 and 45, under the name *Gyrinomene nummularis*, he having at first supposed his species to belong to a new genus and species.

After *Brama* add:

STEINEGERIA, Jordan and Evermann.

Steinegeria, JORDAN and EVERMANN, Proc. U. S. Nat. Mus., 1886, 167. (*Type, S. rubescens.*)

A genus allied to, and possibly belonging to, the family *Bramidæ*, having the body ovate, considerably compressed, closely covered with membranous scales, which are closely imbricated, and with a distinct median keel. Cleft of mouth very oblique, the lower jaw strongly projecting. No distinct lateral line. Dorsal and anal fins somewhat elongate, the former with eleven, the latter with two spines. Caudal lunate, with short and slender peduncle. Ventrals thoracic, not depressible, with one spine and five rays.

Jaws with single bands of small cardiform teeth, those in front largest, especially in the lower jaw. Teeth in villiform bands on the palatines, but absent from the vomer. Premaxillaries protractile; preopercle without angle, with ascending limb finely serrulate, and with a few coarser teeth about the angle. Vent well behind ventrals.

This genus, dedicated by Jordan and Evermann to Dr. Leonhard Stejneger, curator of reptiles in the U. S. National Museum, is, according to Jordan and Evermann, closely allied to *Grammicolepis* and *Psenes*, and is placed by them provisionally in the family *Bramidæ*, although its relations are not definitely determined.

Having been found in the stomach of a Red Snapper, which inhabits considerable depths, it is provisionally placed among deep-sea fishes. The fact of its never having been found in the surface faunas of the Gulf of Mexico gives additional reason for supposing that it is an inhabitant of the deep regions.

STEINEGERIA RUBESCENS, Jordan and Evermann.

Steinegeria rubescens, JORDAN and EVERMANN, Proc. U. S. Nat. Mus., 1886, 467.

Body ovate, considerably compressed, the greatest thickness a little less than half length of head. Anterior of profile from tip of snout to base of dorsal nearly straight. Outline of belly prominent, the axis of body being rather nearer dorsal than ventral outline. Breast and belly not carinate.

The head is but little longer than deep, its upper surface flattish, the bones not very firm; its length contained 2⅔ times in the total length (3½ with caudal); the depth twice (2⅓ with caudal). Interorbital space nearly flat, with two ridges, about as broad as eye, which is 3⅓ in head. Preorbital very narrow, somewhat cavernous, its edge sharply dentate; snout short, 5 in head.

Mouth very oblique, the lower jaw strongly projecting, the broad maxillary reaching to below middle of eye, its length half that of the head. Each jaw with a band of small cardiform teeth, those in front largest, especially in the lower jaw, but all of them small. A band of villiform teeth on each palatine bone, but none on the vomer; premaxillaries protractile. Lower jaw with conspicuous pores

Preopercle forming a nearly even curve, without distinct angle. Ascending limb of preopercle very finely serrulate, with some four or five coarser teeth about the angle. Other opercular bones very thin, with entire edges. Cheeks, opercles, maxillary, and top of head closely covered with scales similar to those on rest of body, but a little smaller.

Gill-rakers rather short and wide apart, 8 or 9 developed on the lower part of the arch, the longest about one-third length of eye.

Body closely covered with membranous scales which are closely imbricated, deeper than long, each with a distinct median keel besides which are some smaller radiating ridges, especially on the scales of the sides of the body. These ridges on the scales give the body a rough appearance, although they are not spingerous. The keels on the scales form continuous ridges, giving the whole body a striated appearance. Scales largest on middle of sides, becoming smaller on back and on belly. No distinct lateral line. Fins with few scales or none.

Dorsal spines very slender and flexible, some of them ending in filaments (all more or less mutilated in typical example). Soft rays separated from spines by a deep notch extending nearly to base of fin. Soft dorsal elevated, the longest rays about 1⅓ in head. Caudal lunate, its peduncle very short and slender. Anal fin high, its spines short and slender, the longest ray 1⅓ in head. No free anal spines. Ventrals inserted before pec torals, their length 1⅕ in head. Ventrals not depressible into a fissure of the abdomen. Pectorals 1⅕ in head. Vent well behind ventrals.

Color in life salmon red, rather bright and nearly uniform, darker on back, silvery under the chin. Fins all salmon, with black areas toward base on both dorsals and anal. Ventrals largely black. Lining of opercles pale.

Radial formula: D. XI–I, 18; A. II, 20; V. 1, 5. Scales ca. 50–26.

A single specimen (Cat. No. 37991, U. S. N. M.), 5 inches in length, in fair condition, was found by Dr. Jordan in the stomach of a Red Snapper at Pensacola, Fla.

Page 220: *Nomeus Gronovii*. Add to synonymy:

GÜNTHER, Challenger Report, VI, Shore Fishes, 1880, 9.

Bathyseriola cyanea. This form, characterized by Alcock as a Carangid with the general aspect of *Cubiceps*, was taken at station 120 of the *Investigator*, in the Bay of Bengal, at a depth of 240 to 276 fathoms (Alcock, Ann. and Mag. Nat. Hist., July, 1891, 23).

Page 222: *Luvarus imperialis.* See the remarks of Bellotti on *Astrodermus elegans* (*Cat. Soc. Nat. Sci. Nap., May 30, 1891*).

Page 229: *Capros aper*, Linnæus. The fact that the habitat of this species is constantly in rather deep water is made more evident by the capture of a specimen off the southwest coast of Ireland at a depth of 180 fathoms, confirming the observations of the French explorers, who found it at from 30 to 175 fathoms off the coasts of France, Spain, and Morocco. Günther is of the opinion that the stragglers which have been found from time to time in considerable numbers along the coast of England came from deep water in the adjoining region (Günther, Ann. and Mag. Nat. Hist., November, 1889, 417).

Page 230: Under *Chilodipteridæ* add:

MELANOSTOMA, Doderlein.

Melanostoma, DÖDERLEIN, Denkschrift k. Akad. Wiss. Wien, XLVIII, 1883, 5.

Body elongate, oval in cross section. Seven gill-rakers. A small row of fine, closely-set villiform teeth in the jaws, on the vomer and palatines; on either side, in advance, a canine tooth in the intermaxillary; a row of canines in the upper jaw, along the inner side of the dentary. Preoperculum finely toothed, operculum with two spines. Two dorsal fins, the first with nine flexible rays, the second not so high. Scales large, thin, and cycloid; head covered with scales, which are almost entirely hidden under the skin.

A single species, *M. japonicum*, Døderlein (*loc. cit.*, Pl. I, fig. 2), was obtained at considerable depths off Tokio, Japan. This species is generally included in the list of deep-sea forms, and is provisionally assigned to the family *Chilodipteridæ*.

Page 230: Cancel the reference to *Parascombrops* in the key to the *Chilodipteridæ*.

Page 232: *Epigonus telescopus* occurs at great depths along the coast of Portugal, where it is rare (Capello, Peixes de Portugal, 1880, 5).

Page 235: *Acropoma.* Add to its synonymy *Parascombrops*, Alcock (see Goode and Bean, Oceanic Ichthyology, p. 231).

Parascombrops is a synonym of *Acropoma*, and *Parascombrops pellucidus* identical with *Acropoma philippinense* (see p. 235). Alcock, Journal Asiatic Society of Bengal, LXIII, Part II, No. 2, 1894, p. 2.

Acropoma philippinense (= *Parascombrops pellucidus*, Alcock) is found in the Bay of Bengal in 75 to 150 fathoms.

Page 237: *Centropristis investigatoris*, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. X, figs.

Prionodes æquidens (Gilbert). This species was obtained by the *Albatross* off southern California, at station 2996. in 112 fathoms (Gilbert, Proc. U. S. N. M., XIII, 1890, 61).

Anthias eos (Gilbert). The *Albatross* obtained numerous specimens of this species from station 2996, off southern California, at a depth of 112 fathoms (Gilbert, Proc. U. S. N. M., XIII, 1890, 62).

Page 237: Under *Centropristis*, add:

CENTROPRISTIS ANNULARIS, GÜNTHER.

Centropristis annularis, GÜNTHER, Challenger Report, I, Part VI, Shore Fishes, 6, Pl. I, fig. C.

Margin of the preoperculum rounded, without stronger spines at the angle; operculum with 3 spines. Reddish, with two incomplete black rings behind the eye, with a large saddle-shaped spot on the back of the trunk, and with some small black dots on the dorsal fin.

Radial formula: D. 10/12; A. 3/7; L. lat. 60.

A specimen, 2 inches in length, was taken by the *Challenger* at station 122, off Pernambuco, in 30 to 350 fathoms (*Günther*).

After Anthias, add:

BATHYANTHIAS, Günther.

Bathyanthias, GÜNTHER, Challenger Report, VI, 6

"Form of the body similar to that of *Anthias*. One dorsal fin with 9 spines; anal with 3; caudal truncated. Teeth in villiform bands, in the jaws, on the vomer and palatine bones, without canines. Tongue smooth. Preoperculum finely serrated, without projection. Scales of moderate size, very finely ciliated. Branchiostegals seven" (*Günther*, *loc. cit.*).

A single species, *Bathyanthias roseus* (Günther, *loc. cit.*, Pl. I, fig. b), was obtained by the *Challenger* at station 122, off Pernambuco, in 30 to 350 fathoms.

SYNAGROPS, Günther.

Melastoma, DÖDERLEIN, Denkschr. d. k. Akad. d. Wiss. Wien, XLVIII, 1883, 5.
Synagrops, GÜNTHER, Challenger Report, XXII, 162.

Shape of the body rather elongate. Upper side of the head with muciferous cavities. Preoperculum finely denticulated, operculum with two points. Two dorsal fins, the first with 9 slender spines, the second rather short. A narrow band of villiform teeth in the jaws, on the vomer and palatine bones, with the addition of a pair of canine teeth in the upper jaw, and a series of similar teeth in the lower. Scales large, thin, and cycloid. Air bladder present. Pyloric appendages in small number (six to seven). Pharynx and peritoneal cavity black (*Günther*, *loc. cit.*).

The type of this genus, *Synagrops japonicus* (Döderlein), Günther, was taken off Tokio from "very great depths."

Page 239: Under *Pristipomatidæ* add:

PROPOMA, Günther.

Propoma, GÜNTHER, Challenger Report, VI, 39; XXII, 15.

"This genus is closely allied to *Heterognathodon*, but differs from it in having 9 dorsal spines only, in lacking the canine teeth in the upper jaw, and in having considerably smaller scales on the back" (*Günther*, *loc. cit.*).

Propoma roseum, Günther (*loc. cit.*). This species was obtained by the *Challenger* off the Ki Islands, at station 192, at a depth of 129 fathoms.

Polyprion, according to Capello, is found along the entire coast of Portugal, and belongs to the open deep sea (Peixes de Portugal, Lisbon, 1880, 5).

Page 241: *Priacanthus catalufa*. Add to synonymy:

Priacanthus macrophthalmus, GÜNTHER, Challenger Report, VI, Shore Fishes, 1880, 9.

Under synonymy of *Polymixia*, insert *Dinemus*, Poey.

Polymixia nobilis was taken by the *Investigator* at station 115 in the Arafura Sea, 188 to 220 fathoms (Alcock, Ann. and Mag. Nat. Hist., 1891, 223).

Page 245:

Scorpæna percoides, Solander (=*S. barathri*, Hector, Trans. N. Z. Inst., VII, 1875, 245, Pl. X; Ann. and Mag. Nat. Hist., XV, 1875, 80 =*S. percoides*, GÜNTHER, Challenger Report, XXII, 17).

Has been found off South Australia, Tasmania, and New Zealand (Hector) down to the depth of 600 fathoms; at Twofold Bay, 120 fathoms, and off the Fijis, Challenger station 117, in 215 fathoms (*Günther*).

Page 246: *Scorpæna scrofa obesa*. Vinciguerra obtained a specimen in 1879, 20 miles northeast of Malta, at a depth of 170 meters, and others nearer the shore at 80 meters. The individual taken at the greatest depth differed from the others, resembling Risso's *Scorpæna lutea*, which he suggested was probably an inhabitant of considerable depths (Crociere delle Violante, 1883, 50).

Steindachner suggests that the *Scorpæna ocellata* of Lowe, described from Madeira, is the young of *Scorpæna lutea*.

Page 248: *Helicolenus*. The range of this genus should be stated as Mediterranean and North Atlantic.

Page 249: *Helicolenus dactylopterus*. Collett records the presence of this species along the entire coast of Norway as far north as Tromsoe and Finmark, and states that off Stavanger and Bergen it is found at depths of 100 to 200 fathoms. An individual of 220 millimeters from Trondhjem's Fiord is in the museum at Trondhjem (Christiania Vidensk. Selsk. Forhandl., 1879, No. 1, 9; Norges Fiske, 19, 226).

It was added to the British fauna in 1889 by the Rev. Mr. Green, who took several specimens from the southwest coast of England in 250 fathoms (Günther, Ann. and Mag. Nat. Hist., Dec., 1889, 417). This completes the chain of localities from the Mediterranean, lat. 36° N. to lat. 65–69° N.

The disposition of the Mediterranean zoologists seems to be to regard this form as identical with the *Sebastes imperialis* of Cuvier and Valenciennes: See the admirable compilation of Döderlein (Manuale Ittiologica del Mediterraneo, 1889–1891, p. 272).

The localities of specimens obtained by the American exploring vessels were not mentioned in the text. They are as follows: Two specimens (Cat. No. 32168, U. S. N. M.) obtained by Capt. J. W. Collins from 40° 02′ N. lat., 71° 02′ W. lon., and an individual (Cat. No. 32167, U. S. N. M.) also secured by Capt. Collins from the same locality. The *Fish Hawk* obtained examples (Cat. No. 31602, U. S. N. M.) from station 1098, in 39° 53′ N. lat., 69° 43′ W. lon., at a depth of 156 fathoms; Cat. No. 31603, U. S. N. M., from station 1097, in 39° 54′ N. lat., 69° 44′ W. lon., at a depth of 158 fathoms, and Cat. No. 31607, U. S. N. M., from station 1092, in 39° 58′ N. lat., 69° 42′ W. lon., at a depth of 202 fathoms.

Page 252: *Pontinus sierra* (=*Sebastoplus sierra*, Gilbert, Proc. U. S. N. M., xiii, 1890, 82). Four specimens were obtained from *Albatross* stations 2996 and 3011, off southern California, in 112 and 71 fathoms.

Sebastes hexanema (Günther, Challenger Report, vi, 40, Pl. xvii, fig. b; xxii, 18). described from off the Ki Islands, *Challenger* station 192, at a depth of 140 fathoms, and subsequently reported by Alcock from the Arafura Sea, *Investigator* station 118, at a depth of 108 to 220 fathoms (Ann. and Mag. Nat. Hist., July, 1891, 23), appears to belong more nearly to the genus *Pontinus* than to any other, having, as it does, 12 dorsal spines, anal III, 5, head scaly above as well as on cheeks and opercles, pectorals not procurrent, pectoral rays simple, suborbital keel with a few strong spines.

Page 253: *Pontinus Kuhlii:* Add to synonymy:

Sebastes kuhlii, GÜNTHER, Challenger Report, vi, Shore Fishes, 3.

Page 259: Under *Sebastes:*

S. hexanema, Günther (Challenger Report, vi, 40; xxii, 18), was taken off the Ki Islands, *Challenger* station 192, in 160 fathoms.

Sebastolobus macrochir, Günther (Challenger Report, *loc. cit.*), was taken by the *Challenger* off Nishima, Japan, in 355 fathoms, as well as in shallower water.

Page 262: *Sebastichthys* (?) *oculatus* (C. & V.). This species, the *Sebastes oculatus* of Günther, the *Sebastes ocellatus* of Cuvier in the illustrated edition of the Regne Animal, was obtained by the *Challenger* at stations 306 and 307, near Magellan Strait, in 147 and 345 fathoms. Günther states that the species lives at certain times or localities much nearer the surface, and is not uncommon along the Antarctic coasts of South America (Challenger Report, xxii, 18).

The following species of *Sebastichthys* have been found off the Pacific coast of North America beyond the 500-foot line:

S. Goodei, Eigenmann (Proc. Acad. Sci. Cal., iii, Mar. 24, 1890; Notes from the San Diego Biological Laboratory, iii, 12; Gilbert, Proc. U. S. N. M., xiii, 1890, 75). Three specimens obtained by the *Albatross* at station 2949, off southern California, in 155 fathoms.

S. alutus, Gilbert (*loc. cit.*, 76). A specimen from *Albatross* station 2946, at a depth of 150 fathoms, off southern California.

S. rupestris, Gilbert (*loc. cit.*, 75). Five specimens from *Albatross* station 2946, off southern California, in 150 fathoms.

S. zacentrus, Gilbert (*loc. cit.*, 77). Three specimens were taken from *Albatross* stations 2893 and 2946, off southern California, in 145 and 150 fathoms.

S. saxicola, Gilbert (*loc. cit.*, 78). Numerous specimens, in deep water, 44 to 155 fathoms, off the coast of southern California.

S. diploproa, Gilbert (*loc. cit.*, 79). Numerous specimens from *Albatross* station 2935, off the coast of southern California, in 124 fathoms.

S. aurora, Gilbert (*loc. cit.*, 80). Several specimens from off the coast of southern California, stations 2948 and 2960 of the *Albatross*, in 266 and 267 fathoms.

S. introniger, Gilbert (*loc. cit.*, 81). Two specimens from *Albatross* station 2948, off the coast of southern California, in 266 fathoms.

S. sinensis, Gilbert (*loc. cit.*, 81). Two specimens from *Albatross* station 3015, off southern California, in 145 fathoms.

Page 265: *Lioscorpius longiceps*, Günther (see Ill. Zool. *Investigator*, Fishes, Pl. IX, fig. 3), was first described from the Ki Islands, *Challenger* station 192, at a depth of 129 fathoms, and was subsequently identified by Alcock (Ann. and Mag. Nat. Hist., August, 1891, 23) from a specimen taken at *Investigator* station 115, in the Andaman Sea, at a depth of 188 to 220 fathoms. After *Lioscorpius* insert:

Family SYNANCEIDÆ.

MINOUS, Cuv. and Val.

Minous, CUVIER and VALENCIENNES, Hist. Nat. Poiss., IV, 420; Günther, Cat. Fish. Brit. Mus., II, 148.
Corythobatus, Cantor, Cat. Malayan Fishes, 45.

A genus found in the Eastern seas and represented by four species; one from the Indian Ocean, Borneo, and China, one from Japan, and one from Celebes, besides the hemibathybial forms from the Bay of Bengal mentioned below.

Minous inermis, Alcock (Journ. Asiatic Soc. of Bengal, 1889, LVIII, Part II, p. 299, Pl. XXII, fig. 4.—Ann. and Mag. Nat. Hist., 6th ser., X, pp. 207-214, Sept., 1892; LXIII, Part II, No. 2, 1894, p. 2), has been found in the Bay of Bengal in depths of from 70 to 150 fathoms. Its curious symbiosis with a species of hydroid polyp, *Stylactis minoi*, has been described by Alcock, and is referred to in another part of this work.

Page 266: *Cottus bathybii*, Günther, Challenger Report, XXII, 62, Pl. X, Fig. C. A single specimen, 2½ inches long, was obtained by the *Challenger* at station 235, south of Yeddo, Japan, in 565 fathoms.

"It may appear matter for surprise," says Günther, "to find a species of *Cottus* at so great a depth as 560 fathoms, and at first sight it did not seem to me improbable that the specimen accidentally entered the mouth of the dredge whilst it was near the surface. However, on further consideration these doubts disappeared, as it is not very likely that a fish living habitually at the bottom, as a *Cottus* must do, should be found floating far from land; moreover the muciferous system is developed to an extraordinary degree, much more so than in the littoral species of the genus."

A species very nearly related to *C. bathybii* was obtained by the *Albatross* in the depths off the Alaskan coast. It has not yet been described.

Page 266: *Icelus*. Two species of this genus were added to the deep-sea fauna by Bean, from the explorations of the *Albatross* in the waters of Alaska, both from off Trinity Islands, as follows:

I. scutiger, Bean (Proc. U. S. N. M., XIII, 1890, 41). Three specimens from station 2853.

I. euryops, Bean (*loc. cit.*, 41). Three specimens from the same locality.

Page 268: *Artediellus uncinatus*. Collett gives a general discussion of the distribution of this species on the coast of Norway, showing its range to be from 20 to 200 fathoms (Medd. om Norges Fiske, 1879-1883, 55).

Under *Icelinus:*

Icelinus filamentosus, Gilbert (Proc. U. S. N. M., XIII, 1890, 85). Several specimens were obtained from *Albatross* stations 2893 and 2959, off southern California, in 145 and 55 fathoms.

I. tenuis, Gilbert (*loc. cit.*, 86). Numerous specimens were taken off the coast of southern California, at *Albatross* stations 2893, 2946, 2950, 2977, and 2983, in 45 to 150 fathoms.

I. fimbriatus, Gilbert (*loc. cit.*, 87). Several specimens from *Albatross* stations 2893 and 2975, off southern California, in 145 and 36 fathoms.

I. oculatus, Gilbert (*loc. cit.*, 87). One specimen from *Albatross* station 2935, off the coast of southern California, in 124 fathoms.

Page 269: *Triglops Pingelii.* Collett reports this species from the Norwegian coast from Varanger Fiord to Christiansand, at depths of 20 to 150 fathoms (Christ. Vid. Selsk. Forh. 1878, No. 4, 7). Lütken has reported it from the Färöe Islands.

Prionistius macellus, Bean (Proc. U. S. N. M., VI, p. 355. Jan. 12, 1884) described from Carter Bay, British Columbia, is near to *Triglops*, and may possibly enter the deeper zones.

Page 270: *Cottunculus microps.* Add to the synonymy:

Cottunculus inermis, VAILLANT, Exp. Sci. Travailleur et Talisman, Poissons, 1888, p. 365, Pl. XXVIII, fig. 2.

Collett records a considerable number of specimens off the Norwegian coast at depths of 100 to 200 fathoms (Medd. om Norges Fiske, 1879–1883, 53).

Page 270: *Cottunculus Thomsonii.* The type specimen was obtained by the *Knight Errant* in the Faroe Channel, station 4, August 10, 1880, at a depth of 335 fathoms.

Page 271: After *Cottunculus* insert:

PSYCHROLUTES, Günther.

Psychrolutes, GÜNTHER, Cat. Fish. Brit. Mus., III, 1861, 516 (type, *Psychrolutes paradoxus*, Günther).

Body tadpole-shaped, tapering, with loose, naked, movable skin. Head large, depressed, snout obtuse, interorbital space broad, concave, smooth. Jaws with villiform teeth in bands on vomer, palatines toothless. Gill-membranes united to isthmus. Gills in 3½ pairs, with no slit behind the fourth. Branchiostegals 7. Fins confluent, the spinous dorsal composed of short, flexible spines, embedded in the skin; soft dorsal short, with its rays close together; anal low; caudal distinct; pectorals long, with broad, procurrent bases. Ventrals I, 3, rather long, approximate, distinct, with base adnate to body.

Psychrolutes zebra, Bean (Proc. U. S. N. M., XIII, 1890, 43). Many individuals obtained by the *Albatross* at station 2848, between Unga and Nagai islands, at a depth of 110 fathoms.

P. paradoxus, the type of this genus, a member of the Alaskan fauna, doubtless also secured below the hundred-fathom line.

Malacocottus zonurus, Bean, is described in Proc. U. S. N. M., XIII, 1890, 43.

Page 279: *Paraliparis rosaceus*, Gilbert (Proc. U. S. N. M., XIII, 1890–1893). A specimen was taken from *Albatross* station 2919, off the coast of southern California, in 984 fathoms.

Page 283: *Bathyagonus nigripinnis*, Gilbert (Proc. U. S. N. M., XIII, 1890, 89). Many specimens were obtained from *Albatross* station 3073, off the coast of Oregon and Washington, in 477 fathoms.

Xenochirus triacanthus, Gilbert (Proc. U. S. N. M., XIII, 1889–1891). Several specimens were obtained at *Albatross* stations 2893, 2973, and 3059, off the coast of California, Washington, and Oregon, in 145, 68, and 77 fathoms.

X. pentacanthus, Gilbert (*loc. cit.*, 91). Several specimens from *Albatross* station 3076, off the coast of Oregon and Washington, in 178 fathoms.

X. latifrons, Gilbert (*loc. cit.*, 92). Numerous specimens were taken at *Albatross* stations 2898, 2935, 2948, 2972, 2973, and 3059, along the coasts of California, Oregon, and Washington, in 61 to 158 fathoms.

Page 289: Family *Nototheniidæ*.—*Notothenia mizops*, Günther (Challenger Report, VI, 16, Pl. VIII, Fig. D.; XXII, 268). Several specimens of this species, from 1½ to 6 inches in length, were taken by the *Challenger* off Kerguelen Island, in 120 fathoms.

Notothenia longipes, Steindachner (Sitzungsber. Akad. Wiss. Wien, LXXII, 70, fig. 7.—Günther, Challenger Report, VI, 21). Specimens identified by Günther with this species were obtained by the *Challenger* at station 306, in the Messier Channel, at a depth of 345 fathoms; also at station 312, in Port Famine, at a depth of 10 to 15 fathoms, and at station 313, off Cape Virgins, in 55 fathoms.

Page 290: *Hypsicometes gobioides.* The fish described under the name *Bathypercis platyrhynchus* by Dr. Alcock, in the Journal of the Asiatic Society of Bengal, LXII, Part II, No. 1, 1893, p. 11, Pl. IX, fig. 1, resembles *Hypsicometes*, Goode. It is from 128 fathoms in the Bay of Bengal. Dr. Alcock states that *Bathypercis* is identical with *Bembrops* of Steindachner (Sitzungsber. Akad. Wiss. Wien, LXXIV, Part I, p. 211).

Page 291: *Champsodon vorax.* A specimen of this species was also taken by the *Challenger* outside Nares Harbor, Admiralty Islands, in 152 fathoms (Günther, Challenger Report, VI, Shore Fishes, 56).

Page 292: *Chiasmodon niger.* Capello records the capture of a single individual at great depth off the coast of Portugal in 1878. (Peixes de Portugal, 1880, 32.)

The only known specimen of *Pseudiscopelus scriptus* was taken by Capt. A. F. Andrea at the entrance to the Old Bahama Channel.

Page 294: *Uranoscopus Kaianus*, Günther (Challenger Report, VI, Shore Fishes, 43, Pl. XIX, Fig. A; XXII, 49). Specimens, from 7 to 10 inches long, were obtained by the *Challenger* at station 192, off the Ki Islands, in 129 fathoms, and at station 188, in the Arafura Sea, in 28 fathoms.

Uranoscopus crassiceps, Ill. Zool. *Investigator*, Fishes, Pl. X, fig. 4.

Page 295: *Gobius cometes*, Alcock. The depth at which this species is found is 98 to 102 fathoms.

Page 296: *Callionymus.* Vinciguerra obtained two small examples of the specimen identified by him with *C. maculatus*, Rafinesque, 20 miles northeast of Malta, at a depth of 170 meters (Crociere delle Violante, 1883, 69).

Page 303: *Lycodes brevipes*, Bean (Proc. U. S. N. M. XIII, 1890, 38). Many specimens were obtained by the *Albatross* at station 2848, between Unga and Nagai islands, at a depth of 110 fathoms.

LYCODES MACROPS, Günther.

Lycodes macrops, GÜNTHER, Challenger Report, I, Part VI, Shore Fishes, 21, Pl. XI, Fig. B.—VAILLANT, Exp. Sci. Trav. et Tal., 306, Pl. XXVI, figs. 2, 2a, 2b, 2c, 2d.

The length of the head is a little more than that of the trunk and a little less than one-fifth of the total. Eyes large, two-sevenths of the length of the head, and longer than the snout, which is broad, with the upper jaw overlapping the lower; teeth in bands of moderate width, subequal in size; a small patch of teeth on the vomer, and a few teeth anteriorly on the palatine bones. More or less shallow grooves along the infraorbital and the mandible. Gill-opening of moderate width. The dorsal commences above the posterior portion of the pectoral; length of the pectoral one-half of that of the head; each ventral reduced to a short simple filament. Yellowish, with nine broad, dark-brown bands across the upper half of the fish, separated from one another by very narrow interspaces of the ground color. The cross-bars are lighter in the center, subocellated, and extend on to the dorsal fin. A brown band runs from the snout through the eye to the end of the operculum; throat and abdomen blackish (*Günther*).

A single specimen, 5 inches long, was taken by the *Challenger* at station 309, Straits of Magellan, in 40 to 140 fathoms (*Günther*).

Page 309: To the synonymy of *Lycenchelys* add:

Lycodophis, VAILLANT, Exp. Sci. Trav. et. Tal., 311. (Type, *L. albus*, VAILLANT.)

Lycenchelys albus (Vaillant), Goode and Bean (*Lycodes albus*, Vaillant, Exp. Sci. Trav. et. Tal., 309, Pl. XXVI, fig. 1). This species is, as suggested by Vaillant, evidently closely allied to *Lycodes murœna*, but it appears to be somewhat thicker, and is, furthermore, found at a much greater depth and much farther to the southward. The description of Vaillant is as follows:

Body very elongate, its height nearly equal to its thickness, and scarcely one-seventeenth of its length; length of head one-eighth length of the body. Head flattened, enveloped in mucous skin; snout rounded; its length one-third that of the head. Mouth small, lips thick, fringed; the upper jaw fastened far beyond the lower one, though the thickness of the integument does not allow us to determine the point where the maxillary terminates. Teeth very nearly conical, pointing backward, in both jaws; teeth also upon the vomer and palatines. A single nostril is distinguishable, tubular, and placed far forward on the border of the lip, so that at first sight it might be mistaken for one of the mucous openings, of which there are about six on the upper jaw, and four or five in each branch of the lower jaw. Eye superior, scarcely visible even in the fresh specimen, being hidden under the skin; diameter scarcely one-ninth of the length of the head and one-third that of the muzzle equaling the width of the interorbital space. The branchial opening is very large, though the branchiostegal membrane does not adhere to the isthmus but by a very slight attachment. The skin of the head is naked.

The vent is found a little in advance of a point which is two-sevenths of the distance from the tip of the snout to the tip of the tail. Scales, resembling pale spots, are very distinct on the posterior part of the body, and in the forward part of the body they may be seen clearly on the ventral portion of the animal after it has been kept in alcohol. A lateral line, scarcely distinguishable, is anteriorly nearly in the middle of the height, but posteriorly descends close to the ventral line.

Dorsals placed far back, commencing at the end of the anterior fourth of the length; the origin of the anal still farther back. These fins are low, exactly similar, coalescing with the caudal. Pectoral large, enveloped in a thick integument; its extremity does not reach to the vertical from the origin of the dorsal. The ventrals are represented each by a single ray apparently, although it is probable that, in reality, there are several united in the same cutaneous envelope.

Color, in fresh condition, white, slightly bluish; with the head, and the dorsal and ventral lines close to the base of the corresponding fins, a clear blue indigo; abdomen, dark; pectorals, ventrals, and the margin of the vertical fins, sepia brown; iris, bluish.

Two specimens were obtained by the French explorers in the North Atlantic at station 133, in 3,975 meters.

Lycenchelys porifer, Gilbert (Proc. U. S. N. M., XIII, 1890, 104). A single specimen, 12 inches long, was obtained from *Albatross* station 3009, off the coast of southern California, in 857 fathoms.

Page 313: Before *Lycodopsis* insert:

APRODON, Gilbert.

Aprodon, GILBERT, Proc. U. S. N. M., XIII, 1890, 106.

Differing from *Lycodes* only in dentition, the teeth being present in a single strong series on the palatines, but none on the vomer. The genus is thus intermediate between *Lycodes* and *Lycodopsis*.

Represented by a single species, *A. Corteziana* (*loc. cit.*, 107), described from six specimens obtained from *Albatross* stations 2925 and 2948, off the coast of southern California, in 339 and 266 fathoms.

Lycodopsis paxillus, Gilbert (Proc. U. S. N. M., XIII, 1890, 105). A single specimen was taken from *Albatross* station 2980, off the coast of southern California, in 603 fathoms.

Lycodopsis pacificus, Collett, was described from a specimen in the Berlin Museum, said to have come from Japan. There is no evidence that it was from deep water.

After *Lycodopsis* insert:

BOTHROCARA, Bean.

Bothrocara, BEAN, Proc. U. S. N. M., XIII, 1890, 38.

This genus resembles *Maynea*, but the vomer and palate are toothless. Weak teeth in the jaws in narrow bands. The lower jaw is barely included. Pseudobranchiæ present. Branchiostegals, six. Gill-membranes narrowly attached to the isthmus. Large pores along the jaws and extending back to the opercle. Scales about as in *Maynea*, not evident on anterior part of the body in my specimens. Ventrals wanting. No pyloric cœca. Intestine short. Vent at the end of the first third of length. Dorsal beginning over base of pectoral, continuous with anal, the rays high (*Bean*).

This genus is represented by a single species, *B. mollis*, obtained at *Albatross* station 2860, off Cape St. James, Queen Charlotte Islands, at a depth of 876 fathoms.

MAYNEA.

Two species of this genus were described by Bean from the explorations of the *Albatross* in the Pacific, as follows:

M. pusilla, Bean (Proc. U. S. N. M., XIII, 1890, 39), obtained at station 2848, in 110 fathoms.

M. brunnea, Bean (*loc. cit.*, 39), obtained at station 2839, off San Clemente Island, southern California, at a depth of 414 fathoms.

Before *Melanostigma* insert:

LYCODAPUS, Gilbert.

Lycodapus, GILBERT, Proc. U. S. N. M., XIII, 1890, 107.

Body naked. Ventrals wanting. Vertical fins united around the tail. Gill-openings wide, continued forward under the throat; the gill-membranes anteriorly narrowly united, loosely joined to the isthmus by a fold of lax skin. Branchiostegals, six. No pseudobranchiæ. Gills, four; a wide slit behind inner arch. Gill-rakers developed. Teeth present in jaws and on vomer and palatines, none of them enlarged. Vent remote from the throat.

Represented by several specimens from *Albatross* stations 2980, 3010, and 3072, off the coast of southern California, Washington, and Oregon, 610 to 1,005 fathoms.

Page 317: *Grammonus*. The genus appears to have two opercular spines rather than one, the lower being almost rudimentary in *O. ater* but more continuous in *O. armatus*.

Oligopus ater. See notes by Bellotti on dentition, habits, etc., of *Pteridium atrum* (Atti. Soc. Ital. Sci. Nat., April 29, 1888, May 30, 1891. *Oligopus armatus* (=*Pteridium armatum*, Döderlein) is a name based upon a single specimen in the Palermo Museum. The distinctive characters proposed by Döderlein for this form are the presence of two distinct opercular spines (the lower one being almost rudimentary in *P. atrum*); the disposition of teeth upon the palatines; the different form of the anterior appendix of the swimming badder, and the dark spots on the body, which are more conspicuous than in *P. atrum* (Döderlein, Descriz. zoölog.-zoötom, di una novella specie di pesci dei mari di Sicilia. Palermo, 1886, con fig.).

Page 318: *Saccogaster maculatus*, Alcock. In addition to the specimens mentioned in the text, an adult male over 3½ inches long was obtained by the *Investigator* in the Bay of Bengal, station 120, at a depth of 240 to 276 fathoms. It was upon this specimen that Alcock made the important studies described by him in the "Proceedings of the Zoological Society," April 7, 1891, entitled "On a Viviparous Bathybial Fish from the Bay of Bengal." The species is figured by Alcock (Ann. and Mag. Nat. Hist., July, 1891, Pl. VII, fig. 3).

Catætyx rubrirostris, Gilbert (Proc. U. S. N. M., XIII, 1890, 111). Four specimens were obtained from *Albatross* stations 2909, 2936, and 2925, off the southern coast of California, in 205 to 359 fathoms.

Page 319: *Diplacanthopoma brachysoma*. Add to synonymy:

Sirembo murænolepis, VAILLANT, Exped. Sci. Trav. et Tal., 273, Pl. XXIII, figs. 4, 4a. Many specimens were obtained off Soudan.

The name *D. Alcockii* is proposed for the Andaman form, identified by Alcock with *D. brachysoma*.

Page 322: *Bassozetus glutinosus*. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. I, fig. 3, Calcutta, 1892. An examination of the figure confirms the opinion that this species belongs to the genus *Bassozetus*, as understood by us.

Page 323: *Bassozetus tænia* was obtained by the *Challenger* in the mid-Atlantic (station 104), lat. 2° 25′ N., lon. 20° 1′ W., at the depth of 2,500 fathoms.

Page 324: *Glyptophidium argenteum*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. II, fig. 3, Calcutta, 1892.

Glyptophidium macropus, Alcock (Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 8, Pl. VI, fig. 3), closely allied to *G. macropus*, was taken by the *Investigator* at station 162, in the Bay of Bengal, 145 to 250 fathoms.

Page 325: *Dermatorus trichiurus*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. I, Fig. I, Calcutta, 1892.

To the synonymy of *Neobythites* add *Pycnocraspedum*, Alcock.

Neobythites squamipinnis, Alcock (=*Pycnocraspedum squamipinnis*), occurs in the Bay of Bengal, in 145 to 250 fathoms.

Neobythites pterotus, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. XI, fig. 4.

Neobythites steatiticus, Alcock (Journ. Asiatic Soc. of Bengal, LXII, Part II, No. 4, 1893, p. 12, Pl. IX, fig. 3), was obtained from 128 fathoms in the Bay of Bengal.

Page 326: *Neobythites macrops*, Günther, is reported by Alcock from the Bay of Bengal, *Investigator* station 115, 180 to 220 fathoms, twenty specimens varying in length from 4 to 8½ inches having been taken in this locality in 1889 (Alcock, Ann. and Mag. Nat. Hist., 1891, July 30). The *Investigator* also obtained it in the Andaman Sea in 265 to 271 (not 71 as stated in text) fathoms.

Page 328: *Bassogigas Gillii*. The type specimen is 18¼ inches long.

Bassogigas grandis, Günther, is represented by a single specimen obtained by the *Challenger* at station 237, south of Yeddo, near Yokohama, Japan, at a depth of 1,875 fathoms.

Bassogigas pterotus, Alcock, was obtained by the *Investigator* at a depth of 1,000 fathoms, at station 104, in the Laccadive Sea (Alcock, Ann. and Mag. Nat. Hist., October, 1890, 297), also at station 117, in the Andaman Sea, 1,748 fathoms (Alcock, Ann. and Mag. Nat. Hist., July, 1891, 30). The specimen obtained at the last station was noteworthy from the fact that its pectoral fin-rays were very prolonged, reaching to the tenth anal ray, while in the female the pectoral fin-rays reached to the first anal ray.

Bassogigas stelliferoides (= *Neobythites stelliferoides*, Gilbert, Proc. U. S. N. M., XIII, 1890, 112). Many specimens were obtained from *Albatross* station 2996, off the coast of southern California, in 112 fathoms.

Page 333: Cancel *Pycnocraspedum*, which, according to Alcock, is synonymous with *Neobythites*, Goode and Bean.—Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 9.

Page 337: Several small specimens of *Dicrolene multifilis*, Alcock, were obtained by the *Investigator* at station 120 in the Bay of Bengal, at a depth of 240 to 276 fathoms; also others of both sexes at station 130 of the same vessel in the Bay of Bengal, in 281 to 258 fathoms (Alcock, Ann. and Mag. Nat. Hist., November, 1892, 348).

A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. II, fig. 4, Calcutta, 1892. An examination of this figure confirms our opinion that the genus *Paradicrolene* of Alcock is precisely equivalent to our *Dicrolene*.

Page 338: *Dicrolene nigricaudis*. This species is described by Alcock in the "Annals and Magazine of Natural History," sixth series, Vol. VIII, p. 30.

Dicrolene nigricaudis—not *multifilis*—(Alcock), *Paradicrolene*, Ill. Zool. *Investigator*, Fishes, Pl. II, fig. 4.

Dicrolene multifilis, Alcock, *Paradicrolene*, Ill. Zool. *Investigator*, Fishes, Pl. XI, fig. 1.

Dicrolene Vaillanti, Alcock, was taken by the *Investigator* in the Laccadive Sea, station 105, 740 fathoms.

Page 340: *Monomitopus*, Alcock. To synonymy add:

"ALCOCK, Ann. and Mag. Nat. Hist., October, 1890, 297," this being a corrected description of the type species.

In addition to the specimen recorded, the *Investigator* obtained another, 6¼ inches in length, in the Bay of Bengal, at station 112, in 561 fathoms (Alcock, Ann. and Mag. Nat. Hist., July, 1891, 29).

Page 340: *Monomitopus nigripinnis*, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. XI, fig. 3.

Page 344: Under *Lamprogrammus* add:

LAMPROGRAMMUS FRAGILIS, ALCOCK.

Lamprogrammus fragilis, ALCOCK, Ann. and Mag. Nat. Hist., Nov., 1892, 348.

A new species, represented by a single male specimen, 19 inches long, obtained by the *Investigator* at station 133, in the Bay of Bengal, at a depth of 678 fathoms. Alcock suggests that it is possible that this specimen may be the male of *L. niger*, described from three female specimens previously studied, although data are not sufficient to determine the fact.

Lamprogrammus niger, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. I, fig. 1, Calcutta, 1892.

Page 345: *Ophidium murænolepis*, Günther (Challenger Report, VI, 46, Pl. XX, Fig. A; XXII, 268). Specimens were obtained by the *Challenger* off the Ki Islands, at station 192, in 129 or 140 fathoms.

Leptophidium. Four species of this genus were described by Gilbert from the *Albatross* explorations on the coast of southern California, as follows:

L. pardale, Gilbert (Proc. U. S. N. M., XIII, 1890, 108). A single specimen, station 3014, in 29 fathoms.

L. microlepis, Gilbert (*loc. cit.*, 109). Several specimens from *Albatross* stations 3015 and 3016, in 145 and 76 fathoms.

L. stigmatistium, Gilbert (*loc. cit.*, 109). A single specimen from *Albatross* station 2996, in 112 fathoms.

L. emmelas, Gilbert (*loc. cit.*, 110). Many specimens from *Albatross* stations 3007 and 3008, in 362 and 306 fathoms.

Page 349: *Ateleopus indicus*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. II, fig. 2, Calcutta, 1892.

Page 354: *Merlangus vulgaris* occurs in 90 fathoms in the Clyde Sea area (Linn. Soc. Journ. Zool., XX, 446).

Melanogrammus æglefinus is found at 90 fathoms in the same region.

Page 355: *Gadiculus argenteus*. Note the extended discussions by Bellotti in the Atti Soc. Ital. Sci. Nat., Milan, January 26, 1879. He identifies specimens obtained by him from the Gulf of Naples with the types of *G. argenteus*, collected by Guichenot in Algiers.

Micromesistius poutassou. Vinciguerra obtained two specimens in the Gulf of Genoa, July 26, 1879, at a depth of about 600 meters (Crociere delle Violante, 86).

Page 357: *Phycis blennioides* (Brünnich), Schneider. A specimen was taken by the Rev. Mr. Green off the southwest coast of Ireland at a depth of 150 fathoms (Günther, Ann. and Mag. Nat. Hist., November, 1889, 417). This observation connects similar ones on the coast of Scandinavia and off Spain and Portugal. Vinciguerra obtained about thirty examples of this species in the Gulf of Genoa, July 16, 1879, at a depth of about 600 meters, and in June of the same year a considerable number of others, at a depth of 90 meters in the same region.

Page 365: *Physiculus*. Gilbert has described two species of this genus from the *Albatross* explorations off the southern coast of California, as follows:

P. rastrelliger, Gilbert (Proc. U. S. N. M., XIII, 1890, 113). Many specimens from stations 3045 and 2987, in 184 and 171 fathoms.

P. nematopus, Gilbert (*loc. cit.*, 114). Many specimens from stations 2997, 3011, 3015, and 3016, in 71 to 221 fathoms.

P. roseus, Alcock (Ann. and Mag. Nat. Hist., July, 1891, 28), is represented by a single specimen, 7 inches in length, obtained by the *Investigator* in the Bay of Bengal, at station 115, in 188 to 220 fathoms. It has the short dorsal nearest to that of *P. peregrinus*, and the short anal nearest to that of *P. fulvus*.

Page 365: *Physiculus argyropastus*, Alcock (Journ. Asiatic Society of Bengal, 1893, LXII, Pl. II, 180, Pl. IX, fig. 2; 1894, LXIII, Part II, No. 2, p. 7), was obtained by the *Investigator* in the Bay of Bengal at 162 and 170 fathoms. Alcock, at the reference last cited, gives a table of characters separating the two Indian Ocean species.

Page 366: *Physiculus Dalwigkii.* Add to synonymy:

(Günther, Challenger Report, vi, Shore Fishes, 63.)

The species was obtained by the *Challenger* off Inosima, Japan, in 345 fathoms.

Giglioli added this species to the fauna of the Mediterranean, August 4, 1879, a specimen having then been taken at Nice (Nature, January 1, 1880, 202). It is probably more or less abundant below the thousand-foot line.

Page 369: *Mora mediterranea.* Vinciguerra obtained about one hundred specimens in the Gulf of Genoa, July 16, 1879, at a depth of about 600 meters (Crociere delle Violante, 88).

Page 370: *Lepidion Inosimæ*, Günther (*Haloporphyrus lepidion*, Günther, Chall. Rep., vi, 63, *Haloporphyrus inosimæ*, Günther, *op. cit.*, xxii, 92).

This species was found by the *Challenger* off Inosima, Japan, in 345 fathoms.

Lepidion Rissoi. A single specimen of this species was obtained by Vinciguerra, July 16, 1879, in the Gulf of Genoa, at a depth of 600 meters (Crociere delle Violante, 90).

Page 372: Depth of *Lepidion ensiferus*, 600 fathoms.

Salilota australis, Günther (*Haloporphyrus australis*, Günther, Ann. and Mag. Nat. Hist., 1878, ii, 19.—*Salilota australis*, Günther, Challenger Report, xxii, 95, Pl. xvii, Fig. B). Two specimens of this species were obtained at Puerto Bueno, on January 9, 1876. Specimens were also secured by the Challenger Expedition at station 316, off Cape Virgins, Patagonia, in 55 fathoms; and at station 314, between Cape Virgins and Falkland Islands, in 70 fathoms. It is included by Dr. Palacky in his lists of deep-sea fishes, and judging from its appearance is likely to be found at greater depths than 70 fathoms.

Antimora microlepis, Bean (Proc. U. S. N. M., xiii, 1890, 38). Two specimens were taken by the *Albatross* from station 2860, off Cape St. James, Queen Charlotte Islands, in 876 fathoms.

Page 376: *Halargyreus Johnsonii.* Add to synonymy:

Günther, Challenger Report, vi, Shore Fishes, 1880, 26.

Page 383: *Onos Reinhardtii.* Add to synonymy:

Günther, Challenger Report, xxxi, 20, Pl. iii, Fig. F.

Rhinonemus cimbrius occurs in 30 to 100 fathoms in the Clyde Sea area (Linn. Soc. Journal, xx, 446).

Page 388: *Bregmaceros McClellandii*, Thompson, was obtained by Alcock in 1893 in 128 fathoms in the Bay of Bengal, and is believed by him to be identical with the immature specimens previously obtained (Journ. Asiatic Society of Bengal, lxii, Part ii, 1893, p. 12).

Page 390: *Macrurus semiquincunciatus* is referred to by Palatky (Die Verbreitung der Fische, Prag, 1891, 24) under the name *sesquicunciatus*.

Macrurus lophotes, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. iii, fig. 1.
Macrurus Investigatoris, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. iii, fig. 4.
Macrurus Petersoni, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. iii, fig. 5.
Macrurus Hoskynii, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. ix, fig. 4.
Macrurus macrolophus, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. xii, fig. 1.
Macrurus semiquincunciatus, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. xii, fig. 2.
Macrurus Hextii, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. xii, fig. 3.
Macrurus Wood-Masoni, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. xiii, fig. 1
Macrurus hispidus, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. xiii, fig. 2.
Macrurus brevirostris, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. xiii, fig. 3.

THE INDIAN SPECIES OF CŒLORHYNCHUS AND MACRURUS.

1. Key to the Indian Species of the Subgenus Cœlorhynchus.

- I. Scales of the body with distinctly radiating spiny ridges, all of which are uniform in size and spinature; pyloric cæca about forty in number.
  - 1. Scales of the body with not more than five spiny ridges; six rows of scales between the after limit of the first dorsal fin and the lateral line; body with numerous cross-bands...... *Macrurus* (*Cœlorhynchus*) *quadricristatus*.
  - Scales of the body with usually eight spiny ridges; four rows of scales between the after limit of the first dorsal fin and the lateral line; color uniform dark stone-gray.............. *Macrurus* (*Cœlorhynchus*) *flabellispinis*.
- II. Scales of the body with parallel spiny ridges, the spinature of the middle one of which is by far the strongest; pyloric cæca twelve in number..................3. *Macrurus* (*Cœlorhynchus*) *parallelus*, Gthr.

2. Key to the Indian Species of the Subgenus Macrurus.

- I. Six branchiostegals [seven to nine rays in the ventral fin].
  - . Second spine of the first dorsal fin remarkably prolonged, more than twice the length of the head; eight rays in the ventral fin.
    - i. Scales small, with five or six well-spaced parallel rows of spinelets. *Macrurus* (*Macrurus*) *lophotes*.
    - ii. Scales large, with about seventeen oblique crowded rows of spinelets............ *Macrurus* (*Macrurus*) *macrolophus*.
  - 2. No greatly prolonged spine in the dorsal fin; seven to nine rays in the ventral fin.
    - i. Scales with rows of spinelets all of which are of uniform small size; greatest height of the body much exceeding that of the tail.
      - a. Seven rays in the ventral fin; snout blunt, not longer than the eye........ *Macrurus* (*Macrurus*) *Hextii*.
      - b. Eight rays in the ventral fin; snout sharp, longer than the eye. *Macrurus* (*Macrurus*) *Wood-Masoni*.
    - ii. Scales with rows of spinelets of which those in the middle row are conspicuously larger than the others; body not abruptly delimited from the tail; nine rays in the ventral fin.. *Macrurus* (*Macrurus*) *Hoskynii*.
- II. Seven branchiostegals [eight to twelve rays in the ventral fin].
  - 1. Usually eight rays in the ventral fin; scales with spinelets which may be in rows or not, but are never densely packed.
    - i. Mouth very large; snout remarkably shallow; barbel considerably longer than the eye; spinelets of the scales without any arrangement; a patch of enlarged cycloid scales behind the first dorsal fin; cheeks, opercles, and belly burnished silver; ventrals eight-rayed.......... *Macrurus* (*Macrurus*) *Petersoni*.
    - ii. Mouth very small; snout deep; barbel not half as long as the eye; spinelets of the scales arranged in definite rows; opercles and belly black; ventrals eight-rayed.......... *Macrurus* (*Macrurus*) *Investigatoris*.
  - 2. Ten rays in the ventral fin; scales with densely packed spinelets which show no arrangement in rows; snout quite peculiar in being vertically truncated with an abruptly prominent median tubercle, its length without the tubercle being not much more than half that of the eye.................... *Macrurus* (*Macrurus*) *brevirostris*.
  - 3. Usually twelve rays in the ventral fin; scales with rows of spinelets which may be either close-set or open.
    - i. Tail lash-like and filiform; spinelets of the scales in definite short rows, eight or nine in number.
      - a. Head large, its length about one-fifth of the total; gill-openings extremely wide, the membranes being united only quite in front; ventrals (eleven or) twelve rayed...... *Macrurus* (*Macrurus*) *polylepis*.
      - b. Head singularly small, its length about one-eighth the total; gill-openings of the usual width, the membranes being broadly united; ventrals with twelve rays....... *Macrurus* (*Macrurus*) *pumiliceps*.
    - ii. Body of the usual tapering form; spinelets of the scales in densely crowded rows, fifteen in number, besides short rows in between; ventrals (eleven or) twelve rayed............. *Macrurus* (*Macrurus*) *semiquincunciatus*.

Page 391: *Cœlorhynchus pumiliceps*, Alcock (Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, 1894, p. 11), a form evidently close to *M. sclerorhynchus*, was found by the *Investigator* at station 150 in the Laccadive Sea at 719 fathoms depth.

Page 397: *Cœlorhynchus quadricristatus* (Alcock), Ill. Zool. *Investigator*, Fishes. Pl. III, fig. 1.

Cœlorhynchus flabellispinis, Alcock (Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 9), was found by the *Investigator* at station 150, Laccadive Sea, 719 fathoms.

Cœlorhynchus atlanticus. The Prince of Monaco obtained a specimen at Funchal, Madeira, in 1889.

Page 400: *Cœlorhynchus japonicus*, Schlegel. This species was taken by the *Challenger* off Inosima, Japan, in 345 fathoms (Günther, Challenger Report, VI, Shore Fishes, 1880, 63).

If the species called *M. japonicus* by Vaillant should prove to be distinct from our *M. occa*, it should be remembered that Vaillant has mentioned it under the name *M. affinis* (Exp. Sci. Travailleur et Talisman, Poissons, 1888, p. 51.)

Macrurus lophotes, Alcock. An examination of this figure suggests the idea that this species belongs to the genus *Coryphænoides*, rather than to *Macrurus*, the mouth being terminal rather than inferior.

Page 403: *Coryphænoides sulcatus.* Cancel the description. This species is fully described on page 410 in connection with the genus *Trachonurus*.

Page 406: *Mystaconurus heterolepis*, Alcock, Ill. Zool. *Investigator*, Fishes, Pl. III, fig. 3.

Page 414: Add the following new species described in a paper entitled "Di una nuova specie di Macruride appartenente alla fauna abissale del Mediterraneo," *Zoologischer Anzeiger*, XVI, No. 428, 11 Sept., 1893, p 342.

CHALINURA MEDITERRANEA, GIGLIOLI. (Figure 345A.)

Only two specimens known, preserved in the central collection of Italian vertebrata in the Royal Zoological Museum, Florence; ichthyological catalogues Nos. 2016, 2017. They were both collected by me during the first deep-sea exploration of the Mediterranean by the Italian man-of-war steamer *Washington* off the west coast of the island of Sardinia with the trawl, at station X (lat. 41° 23′ 48″ N., lon. 7° 8′ 54″ E., depth 2,904 meters) and station XI (lat. 41° 18′ 42″ N., lon. 6° 54′ 2″ E., depth 2,805 meters), on the 10th of August, 1881. They have hitherto been mentioned with doubt as referable to *Coryphænoides serratus* (Lowe), a species insufficiently described, of which the type specimen is lost, none having been found since to fit the incomplete diagnosis given by Lowe (Proc. Zool. Soc. London, 1843, 91).

These two specimens are very similar and apparently adult; both appear to be males, but the genital organs are immature. They are both almost denuded of scales. These are evidently very deciduous, smooth, very slightly fluted longitudinally, cycloid; rather large; some show slightly fine radiating striæ. When fresh the color of these two specimens was a light pink or flesh color, the head and belly strongly tinted with violaceous black; the latter on account of the intense black peritoneal lining of the visceral cavity, the former owing to the deep black of the inside of the mouth and branchial chambers; the branchiostegal membranes are also deep black. Fins colorless. Length of the first specimen, 215 millimeters; of the second, 235 millimeters. The greatest height of the body is from the ventrals to the first dorsal; it is less than the length of the head, and contained about 5½ times in the total length. That of the head being contained about 4⅔ in the total. The eye is small, its transverse diameter being contained about 1½ in the length of the snout; the width of the interorbital area above is equal to the length of the snout. The fore part of the body between the eyes and the first dorsal is remarkably gibbous.

The snout is broad, truncate, not much produced, tricuspidate; three ridges running along its wide upper surface, median one gibbous; the subocular ridges are less marked, and the suborbital one is not joined to the angle of the preoperculum.

Mouth large, lateral, subterminal; intermaxillary heterodont with outer series of strong widely set teeth and an inner villiform band; mandibulary teeth uniserial, large.

Lower jaw slightly shorter. No teeth on vomer and palatines. Tongue voluminous, smooth, with a band of singular spheroidal papillæ down its middle. Cleft of the mouth extending to vertical of hind margin of eye. No pores. Branchial apertures wide; small pseudobranchiæ. Gill-rakers spiny, stout, in double series on the anterior arch. Branchiostegal membranes free from the isthmus.

Barbel slender, longer than the transverse diameter of the eye. Preoperculum with hinder margin nearly straight, rounded below and very slightly crenulated.

The first dorsal fin commences exactly above the insertion of the pectorals; its first spine is very short, the second ray very robust, longest, regularly serrated in its front up to its extremity, which is prolonged in a filament; its length is equal to the distance of the dorsal from the eye. The second dorsal commences above the sixth anal ray; its rays are very low, especially in the first third of its length. The anal commences immediately behind the anal aperture, it is at least five times as high as the second dorsal, it gradually becomes lower toward the end of the caudal region, where it is nearly subequal to the end of the second dorsal, but always higher. I can make out in my specimens a caudal, continuous with the dorsal and anal, but distinguished by its longer rays. The pectorals are in a bad condition in both specimens, but the upper ray appears to be slightly elongated. The ventrals are inserted below the pectorals, but distinctly in advance; their outer ray is filamentous, stouter, and greatly prolonged, reaching to the twentieth anal ray.

Radial formula: I D. $\frac{2}{8}$; II D. 110 circa; A. 120 circa; C. 3; P. 20; V. $\frac{1}{11}$; Br. VI.

I may add that I have taken extra care in making out the radial formula, which is not an easy undertaking in fishes of this sort. Except the second dorsal and anal in which the given number of the rays is approximated, I am quite certain about the rest.

Chalinura mediterranea is evidently allied to *C. simula*, Goode and Bean, and to *C. leptolepis* (Günth.), but has a shorter and more carinate snout than either. In this it approaches more *C. fernandeziana* (Günth.), whilst its ventrals with a larger number of rays bring it near *C. Murrayi* (Günth.). But it is withal sufficiently different to warrant its specific distinction. I have to thank my friend, Prof. G. Brown Goode, for having specially called my attention as to the better determination of these two specimens, which I had left up to the present under the name (with query) of *Coryphænoides serratus* (Lowe),* a species which must be canceled from the "Systema Piscium."

I had been hitherto under the impression that *Krohnius filamentosus*, Cocco, might be the larval form of the fish I have now named *Chalinura mediterranea;* but a careful examination has now shown me that that singular larval form, evidently a Macrurid, although possessing the shape and some of the indications of characters pertaining to *Chalinura*, has a smooth second ray in its first dorsal. The doubt must yet remain, for I do not think it likely that it should prove to be the larva of my *Hymenocephalus italicus.*

HENRY H. GIGLIOLI.

ROYAL ZOOLOGICAL MUSEUM, *Florence, June 20, 1893.*

Page 417: *Trachyrhynchus longirostris*, Günther (*Macrurus longirostris*, Günther, Ann. and Mag. Nat. Hist., 1878, II, 23; *Trachyrhynchus longirostris*, Günther, Challenger Report, XXII, 153, Pl. XLI, Fig. B). Two specimens, 20 inches long, were obtained by the *Challenger* at station 169, northeast of New Zealand, in 700 fathoms.

Trachyrhynchus scabrus. Capello has observed several specimens in the markets of Lisbon and at Setubal (Peixes de Portugal, 1880, 32).

Page 418: *Macruronus Novæ-zelandiæ.* Add to synonymy:

GÜNTHER, Challenger Report, VI, Shore Fishes, 1880, 22.

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* NOTE.—Enrico H. Giglioli, La scoperta di una fauna abissale nel Mediterraneo. Relazione preliminare (Atti del III, Congresso Geografico internazionale, Vol. I, p. 366, estr. p. 39). Roma, 1881. Id. ibid., Vol. II, p. 195 (estr., p. 33). Roma, 1883.—Id. Recherches relatives a la Faune sous-marine de la Méditerraneé (Ann. Sc. Nat. Zool., XIII, 20*, art. 9). Paris, 1882.—Id. in "Nature" XXIV, p. 381, London, 1881.—E. H. Giglioli, and A. Issel, Pelagos, p. 227. Genova, 1884.

MALACOCEPHALUS SUBLÆVIS, (Vaillant.)

Coryphænoides æqualis, Vaillant, Exp. Sci. Travailleur et Talisman, 1888, p. 225 (part), Pl. XIX, figs. 2, 2a–c.

Coryphænoides sublævis, Vaillant, op. cit., p. 386.

Vaillant (p. 225) describes at length, under the name *Coryphænoides æqualis*, fishes taken off the coast of Morocco and the Cape Verdes, which he subsequently (p. 386) says are more closely allied to *Malacocephalus lævis*, Gthr., and for which he proposes the name *Coryphænoides sublævis*.

Page 420: *Bathygadus furvescens*, Alcock (Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, 1894, p. 14), was obtained by the *Investigator* at station 150, off the Maldives, in 719 fathoms.

Page 426: *Lepidopsetta maculata*, Günther, was taken by the *Challenger* in the Antarctic station 145A, off Prince Edward Island, 310 fathoms (Challenger Report, VI, 18, Pl. XXX, fig. C).

CHASCANOPSETTA, Alcock.

Chascanopsetta, Alcock, Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 14, 1894.

C. lugubris, Alcock (*l. c.*, Pl. VI, fig. 4), was obtained by the *Investigator* in the Bay of Bengal, station 162, 145 to 250 fathoms.

PŒCILOPSETTA, Gthr.

P. maculosa, Alcock (Journ. Asiatic Society of Bengal, LXIII, Part II, No. 2, p. 16, Pl. VII, fig. 1), was obtained by the *Investigator* in the Bay of Bengal, station 162, 145 to 250 fathoms, and *P. prælonga* (*l. c.*, p. 17, Pl. VII, fig. 3) at station 151, off Colombo, in 142 to 400 fathoms.

Page 439: After *Lepidorhombus megastoma* add:

LEPIDORHOMBUS BOSCII (Risso).

Pleuronectes Boscii, Risso, Ichth. Nice, 319, Pl. VII, fig. 33.—Bonaparte, Faun. Ital. Pesce.—Canestrini, Arch. Zoöl., I, 19, tav. II, fig. 2.

Hippoglossus Boscii, Cuvier, Règne Animal.—Risso, Eur. Mérid., III, 246.

Rhombus Boscii, Cuvier, Règne Animal, 2d ed., 311.—Günther, Ann. and Mag. Nat. Hist., Dec., 1889, 419.

The height of the body is two-fifths of the total length (without caudal), the length of the head nearly one-third; scales rather small, with the posterior margin ciliated, truncated or rounded, covering nearly the whole head, the interorbital space and maxillary included; interorbital space extremely narrow; the diameter of the eye is one-third the length of the head. Lateral line with a sub-semicircular curve above the pectoral fin. Lower jaw prominent; maxillary nearly one-half the length of the head. The teeth in the jaws form narrow bands; vomerine teeth in small number (two or three), implanted somewhat behind the front margin of the vomer. The lower eye a little in advance of the upper. The dorsal fin terminates at a distance from the caudal, which is somewhat less than the depth of the free portion of the tail; its longest rays are at the commencement of the posterior third of the fin, where they are two-fifths of the length of the head, and rather shorter than the pectoral. No spine before the anal. Body very light colored, without spots; two large rounded deep black spots occupy the posterior portion of the dorsal and anal fins (*Günther*).

Radial formula: D. 80–81; A. 63–65; L. lat. 85.

This species was added to the British fauna by the discovery in 1889 of several specimens off the southwest coast of Ireland at 150 to 315 fathoms, the largest being 14 inches in length, the smallest about half that size.

"This species," writes Dr. Günther, "originally discovered in the Mediterranean, was, probably owing to the small size or condition of the specimens, inaccurately described and figured by Risso, Bonaparte, and Canestrini. The scales were represented much too large, and the notes on the dentition were vague. Hence it was referred by myself to the genus *Arnoglossus* at a time when no specimens were available for examination (Fish, IV, 416), but there was sufficient evidence of its being a very distinct species from any of the flat fishes known to inhabit the British Seas. Nevertheless, we find it in the 'Fishes of Great Britain by F. Day (who seems to have followed Giglioli) relegated to the synonymy of *Rhombus*' *megastoma*, an error which, in 1883, was corrected by Vinciguerra, and in 1887 by Kolambatovic, both of whom clearly pointed out the distinctive characters of these two species."

"*Rhombus Boscii* may be recognized at the first glance by its enormous eyes, which are much larger than in *Rhombus megastoma*, as may be seen from the following measurements:

	R. megastoma.	R. Boscii.
	Lines.	*Lines.*
Total length	198	170
Length of head	50	46
Length of osseous orbit	11	15
Length of snout	15	11

"*Rhombus megastoma* never has the large black spots on the dorsal and anal fins which are so conspicuous a feature in *R. Boscii*, although they may also disappear in specimens of the latter species if they have been allowed to get stale before they are placed in spirits" (*Günther*).

This species was added to the British fauna by the discovery in 1889 by the Rev. Mr. Green, of several specimens off the southwest coast of Ireland, at 150 and 315 fathoms (Günther, Ann. and Mag. Nat. Hist., December, 1889, 418).

Arnoglossus Grohmanni, Bonaparte (*Pleuronectes Grohmanni*, Vaillant, Exp. Sci. Trav. et Tal., 188). The French explorers obtained specimens of this well-known Mediterranean form off the coast of Morocco in 112 and 120 meters, off Spain in 106 meters, off Soudan in 102 to 175 meters, and about the Cape Verde Islands in 75 to 90 meters.

Page 457: After *Microchirus variegatus* add:

SOLEA GREENI, Günther.

Solea Greeni, GÜNTHER, Ann. and Mag. Nat. Hist., December, 1889, 419.

This species is very elongate, its greatest width being one-third of the total length (without caudal); the length of the head is contained five and a half times in the total length. The shape of the head resembles very much that of the common sole. The eyes are of medium size, about as long as the snout and one-fifth of the length of the head; the width of the interorbital space equals the vertical diameter of the eye. None of the nostrils dilated, that in front of the lower eye being prolonged into a short tube; the vertical fins are rather low and covered with scales. The right pectoral very small, about as long as the eye; the left pectoral is reduced to a minute ray. The ventrals, also, are small, but the extremities of their middle rays extend backwards to the anal fin. The dorsal and anal terminate immediately in front of the caudal. Scales of both sides ctenoid, more so on the colored than on the blind side. Coloration uniform gray (*Günther*).

Radial formula: D. 81; A. 65; P. dextr. 5; P. sin. 1; L. lat. 144.

This species is distinguished by characters which bring it near to *Solea vulgaris* as well as to *Solea variegata*. From the former it is separated by the rudimentary structure of its pectoral fins, from the latter by the number of its fin rays, by its much smaller scales, and by its coloration. Unfortunately only one specimen was obtained, off the southwest coast of Ireland, nearly 6 inches long, at a depth of 150 fathoms. It is in a perfect state of preservation (*Günther*.)

Solea umbralites, Alcock (Journ. Asiatic Soc. of Bengal, LXIII, Part II, No. 2, p. 17, Pl. VII, fig. 3), was obtained by the *Investigator* in the Bay of Bengal, stations 169 and 170, 91 to 107 fathoms.

Page 458: *Aphoristia septemstriata*, Alcock. A good figure is given in "Illustrations of the Zoology of H. M. S. *Investigator*," Part I, Pl. II, fig. 1, Calcutta, 1892.

Aphoristia trifasciata, Alcock *l. c.*, p. 18, Pl. VII, fig. 4), was found at station 162, 145 to 250 fathoms, and station 164, 195 to 210 fathoms, in the Bay of Bengal.

Page 462: *Trigla gurnardus* occurs in 80 to 90 fathoms in the Clyde Sea area (Linn. Soc. Jour. Zool., XX, 446).

Page 463: *Trigla cavillone.* Vinciguerra identified with *Lepidotrigla aspera* specimens obtained by him in the Gulf of Genoa at a depth of 90 meters.

Page 470: *Peristedion Murrayi*, Günther. Alcock records the capture of a single specimen identified by him with this species, obtained by the *Investigator* at station 115, in the Bay of Bengal, at a depth of 188 to 220 fathoms.

P. cataphractus (L.) Cuv., is said by Risso to occur in deep water off Nice.

Page 471: *Peristedion Rivers-Andersoni*, Alcock (=*Peristethus Rivers-Andersoni*, Alcock, Journ. Asiatic Soc. of Bengal, LXIII, Part II, No. 2, 1894, p. 7, Pl. VI, figs. 2, 2a, 2b) was taken by the *Investigator* at station 151, off Colombo, in 142 to 150 fathoms.

Page 485: *Lophius mutilus*, Alcock (Journ. Asiatic Soc. of Bengal, LXII, Part II, No. 4, 1883, p. 11; Ill. Zool. *Investigator*, Fishes, Pl. IX, fig. 2), is from 128 fathoms in the Bay of Bengal. We propose the generic name *Lophiodes* for this type of Lophiidæ, having the second portion of the spinous dorsal obsolescent.

Lophius lugubris, Alcock (*op. cit.*, LXIII, Part II, No. 2, 1894, p. 4), closely allied to the preceding, was found by the *Investigator* at station 151, off Colombo, in 142 to 400 fathoms. It likewise is a *Lophiodes.*

Page 499: *Onchocephalus vespertilio.* Add to synonymy:

Malthe vespertilio, GÜNTHER, Challenger Report, VI, Shore Fishes, 1880, 7.

MALTHOPSIS, Alcock. (Figure 411.)

Malthopsis, ALCOCK, Ann. and Mag. Nat. Hist., July, 1891, 26.

A genus resembling *Onchocephalus* (=*Malthe*), but having only two gills on each side instead of two and a half, represented by the single species, *Malthopsis luteus* (Alcock, *loc. cit.*, Pl. VIII, fig. 2), of which ten specimens were taken by the *Investigator* at station 115, in the Andaman Sea, at a depth of 188 to 220 fathoms.

Page 499: *Halieutæa nigra*, Alcock (Ann. and Mag. Nat. Hist., July, 1891, 24), was taken by the *Investigator* at station 115, in the Andaman Sea, at a depth of 188 to 220 fathoms, and is so close to *H. coccinea* that Alcock considers it possible, though hardly probable, that it may be its young.

Halieutæa spongiosa, Gilbert (Proc. U. S. N. M., XIII, 1890, 124). Numerous specimens were obtained from *Albatross* station 2992, off the California islands, at a depth of 400 fathoms.

Page 499: *Halieutæa fumosa*, Alcock (Journ. Asiatic Soc. of Bengal, LXIII, Part II, No. 2, 1894, p. 5), is a new species found by the *Investigator* in the Bay of Bengal, station 162, 145 to 250 fathoms. It would appear to belong to a distinct subgenus or genus.

Page 501: *Dibranchus nasutus*, Alcock (Ann. and Mag. Nat. Hist., July, 1891, 24, Pl. VII, fig. 1), was obtained by the *Investigator* in the Andaman Sea, at station 115, in 188 to 220 fathoms.

Dibranchus micropus, Alcock (*loc. cit.*, 25, Pl. VII, fig. 2), was obtained by the *Investigator* at station 120, in the Bay of Bengal, at a depth of 240 to 276 fathoms. Another specimen was obtained from *Investigator* station 128, in the Gulf of Manaar, at a depth of 902 fathoms (Alcock, Ann. and Mag. Nat. Hist., November, 1892, 348).

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[NOTE.—The most important references are in heavy-face type.]

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